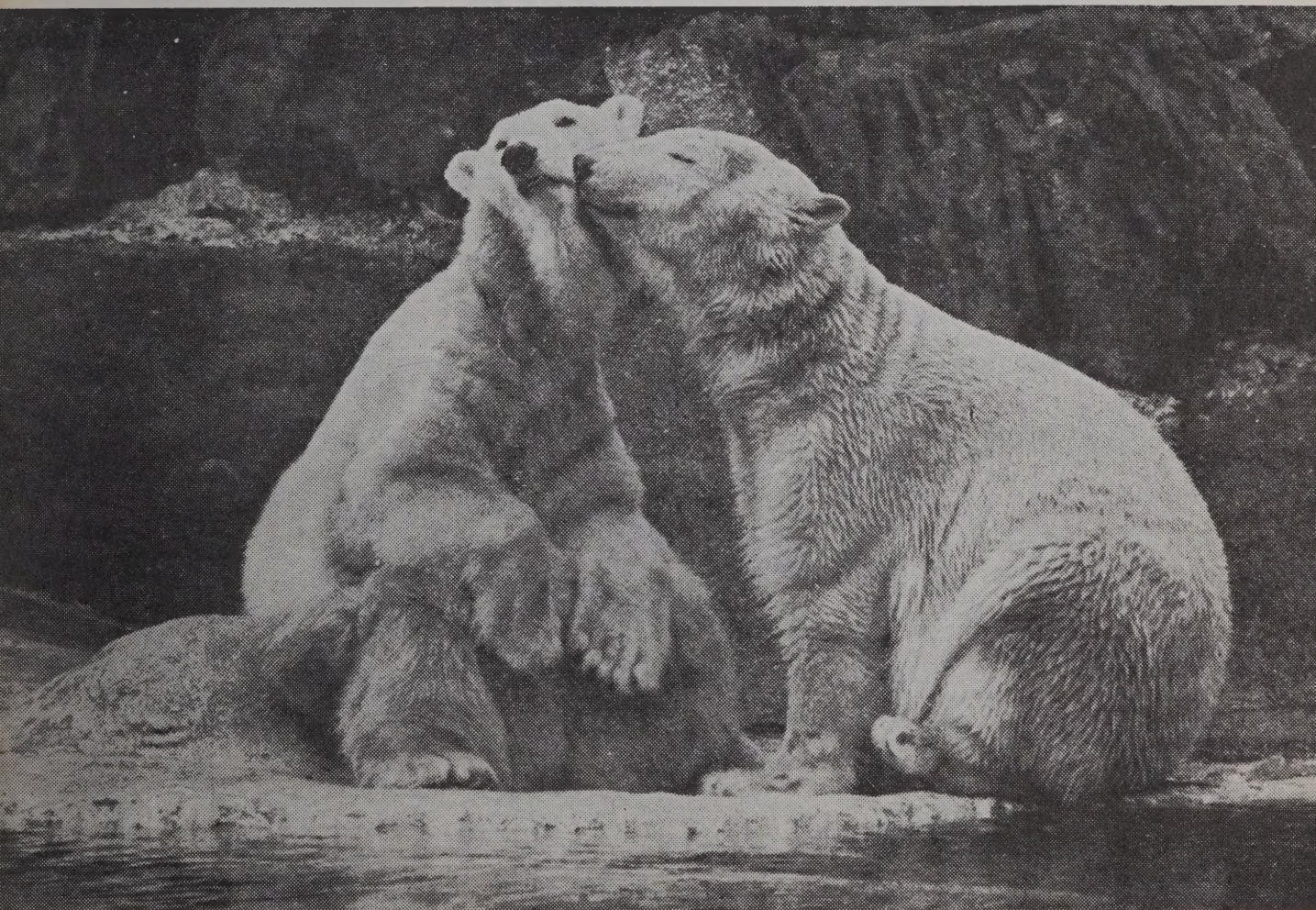


THE POLAR TIMES



New York News

News photo by Michael Lipack



ARCHIVIST HONORED—Colleagues bid farewell to Herman R. Friis (left) at his retirement party in the Archivist's Reception Room. At right is John Porter Bloom. Friis retired as Director of the Center for Polar Archives at the end of the year. He had joined the Archives in 1938 and assumed the directorship of the Center in 1967. At his party, the Archivist awarded him with the Exceptional Service Award, citing his "distinguished, creative, loyal and enthusiastic commitment as an archivist and historical geographer to the scholarly ideals and objectives of the National Archives." Paying Friis honor were not only NARS staff members but scholars from numerous other agencies and institutions, such as the Smithsonian, Library of Congress, and National Science Foundation. A pioneer in the compilation of cartographic records, Friis worked in Antarctica as a geographer and has maintained a wide range of professional interests in polar regions. Among the most cherished honors he has been granted is the naming of hills in Antarctica after him. "Friis Hills" are in Victoria Land, 35 miles from McMurdo Sound. In retirement, Friis plans to continue his writing and research.

National Archives Newsletter February 1976

One of the foremost Yukon historians and polar explorers in the world will receive the highest award given to civilians by the Canadian government Oct. 20.

Alan Innes-Taylor, 77, whose travels have taken him to as far as Antarctica and Greenland, will receive the Order of Canada from Canadian governor - General Leger during formal ceremonies later this month in Ottawa.

From 1920 to 1925 Innes-Taylor was a constable in the Royal Canadian Mounted Police. Four years later he sailed with Admiral Byrd on his first trip to the Antarctic as Byrd's dog handler. On his second trip to Antarctica, Innes-Taylor was Byrd's chief of operations.

Innes-Taylor served in the Canadian and American air forces. During World War II he was pilot for the Royal Air Force. He also was a consultant to the U.S. Air Force on survival and served in Greenland and Ladd Air field, now Ft. Wainwright, located near Fair-



banks. After retiring from the U.S. Air Force in 1953 at the rank of lieutenant colonel, Innes-Taylor canoed 1,700 miles through the Yukon. He then was archivist for the Yukon territorial government. Innes-Taylor and his wife, Elizabeth live in Whitehorse, where he is semi-retired.

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Innes-Taylor and his wife, Elizabeth live in Whitehorse, where he is semi-retired.

The Polar Times

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No. 83

DECEMBER 1976

Scientists Drill in Antarctic Shelf To Unlock Secrets of Ancient Ice

By WALTER SULLIVAN

The New York Times

MCMURDO SOUND, Antarctica—An oceanic "lost world" cut off from the sun, as well as from human scrutiny, for thousands and perhaps millions of years is being probed by a team of scientists who are drilling through the Ross Ice Shelf of Antarctica.

In an effort reminiscent of the ill-fated Mohole Project, the new drilling project is designed to attack a highly diverse array of problems—physical, biological and economic. The Mohole Project, a hole to be drilled through the sea floor to the "Moho," or bottom of the earth's crust, was abandoned when the cost became unacceptably high.

Global Implications

The Ross Ice Shelf Project, or RISP, is an international effort with 10 nations participating and involves a variety of ice studies in addition to the drilling. The drilling, despite many difficulties, has penetrated halfway through the shelf, which at that point is 1,375 feet thick.

The goals of the project have global implications. They include, for example, an assessment of the possibility that the Marie Byrd Land ice sheet is unstable and may eventually slip into the sea, raising global sea levels markedly.

Another goal is to explore the origin of the so-called "Antarctic bottom water," which creeps north along the floors of the world oceans. This water, through its long contact with the sea floor, becomes rich in nutrients, and where it wells up to the surface there is a bloom of oceanic life.

It is believed that this water originates beneath the two great ice shelves of Antarctica, the Ross Shelf and, in particular, the Ronne Ice Shelf on the Atlantic Ocean side of the continent. The origin of the Antarctic bottom water is of international interest in that it is indirectly responsible for much of the world's oceanic food.

The Ross Ice Shelf is roughly the size of Spain and is an oceanic extension of the continental ice sheet of Antarctica. At the drill site, 470 miles southeast of here, it is 1,375 feet thick. Along its northern front, where it gives birth to icebergs sometimes 100 miles long, it is uniformly about 700 feet thick.

This 400-mile frontal cliff is strikingly level because the ice, once waterborne, tends to spread to a uniform thickness, like spilled molasses. At the drill site,

echo sounding has shown 780 feet of water beneath the ice and a sea floor laden with at least several thousand feet of sediment.

It is planned to drive a coring device some 90 feet into this bottom sediment to obtain a cross-section of its layers. This should reveal the history of the shelf, including when it was grounded at that location and when there was open sea at the site.

Some scientists believe that great ice shelves like the Ross Shelf serve as dams preventing inland ice from flowing readily out to sea. When a change in sea level or climate tips the environmental scales for such a shelf, according to this hypothesis, it rapidly breaks up into icebergs, freeing the inland ice to surge into the sea.

There is currently much debate as to whether or not the Marie Byrd Land ice sheet is unstable and might surge into the sea if the shelves on either side of it—the Ross and Ronne shelves—should break up. It is in West Antarctica, so called because it lies chiefly in the Western Hemisphere.

While the far larger East Antarctic ice sheet rests on a continental block and is largely hemmed in by mountains, much of that in West Antarctica lies on land that is far below sea level.

The ice, fed by frequent snows, flows rapidly toward the Atlantic and Pacific. The drill site was chosen to be in an area of rapid flow from Marie Byrd Land. It moves north about three feet a day.

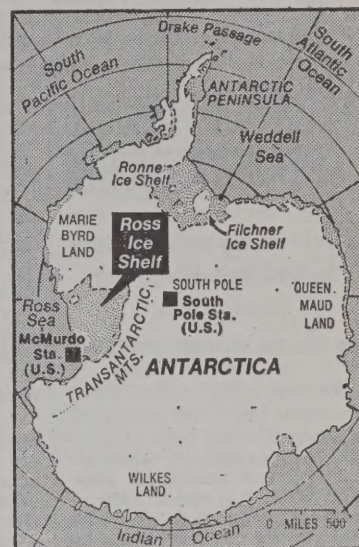
That the West Antarctic ice sheet may have gone to sea between the last two ice ages, and might do so again, is hinted at by evidence that sea levels were 30 feet higher then than they are now.

World's Oceans Rising

While some ice specialists believe such a slippage, or surge, could occur rapidly enough to wreak havoc in low-lying cities and food-producing areas, most seem to favor a more gradual movement. If spread over centuries, however, it could still have major economic and political consequences.

Canadian observations indicate that, about 8,000 years ago, the ice sheet north of the Great Lakes disappeared with remarkable speed, perhaps within a few decades. It has been suggested that rising sea levels in the Arctic Ocean caused the grounding line of a northern ice shelf to move south into Hudson Bay until the shelf broke up.

The world's oceans are currently rising about one millimeter a year, or four inches a century, and probably the chief uncertainty as to the reason for this



The New York Times/Dec. 12, 1976

concerns what is happening beneath the two great Antarctic shelves.

Some believe that sea water is freezing onto the shelf bottoms, subtracting fresh water from the seas and causing the high salinity that makes the bottom water hug the bottom. Others say the shelf bottoms are being wasted away by ocean currents. From the ice samples obtained all the way to the bottom, this debate should be resolved.

RISP also involves an unusual fishing expedition. Whereas hardy winter fishermen in the northern United States drill holes in lake ice a foot of two thick, here the ice is 1,375 feet thick.

Baited lines, nets and traps will be lowered through the hole being drilled. Two other holes at the site had to be abandoned. One was to provide the University of Bern in Switzerland with melt water samples representing specimens of precipitation in past centuries. The other was to produce a top-to-bottom series of ice cores for a variety of studies at the State University of New York in Buffalo.

Because of various difficulties the hole now being drilled is dry although it was originally planned to keep it filled with water to neutralize the pressure of the surrounding ice and of sea water once the bottom is reached. It was feared that such water could blow the drill out of the hole. Water may, however, be introduced into the hole before the bottom is reached.

Not only will the under-ice explorers grab, once the hole is complete, they will also look and listen. An underwater television system, with videotape recorder, will be lowered through the hole as will microphones to eavesdrop on the sounds emitted by any creatures there. The tele-

vision system has two lenses, one pointed down and one aimed horizontally. Still-picture cameras will also be lowered.

It is assumed that there are at least some forms of life beneath the shelf, although whether large animals exist there is uncertain. Air breathers, such as seals and whales, are unlikely. However, ocean currents flowing in from the Pacific should provide sufficient nutrients for many other species, some highly special-

ized for this environment.

As Dr. John W. Clough, science director of the project, and an assistant professor of geophysics at the University of Nebraska, has put it, the discovery of any form of life should "shed considerable light on the life processes taking place in complete and perpetual darkness."

It may be, for example, that novel microbial interactions are taking place

whereby organisms that usually depend on sunlight for synthesis of organic material use, instead, the light from luminescent creatures.

The National Science Foundation is providing a large part of the funds and United States Navy aircraft the support for RISP. Other participating nations are Australia, Britain, Denmark, Japan, New Zealand, Norway, the Soviet Union, Switzerland and West Germany.

12 NATIONS DISCUSS ANTARCTIC RICHES

Secret Parley in Paris Looks to Problems After 1989

By CLYDE H. FARNSWORTH
The New York Times

PARIS, July 12—Twelve countries have just concluded a secret meeting here on possible exploitation of Antarctica's mineral resources after 1989. The 12 agreed in 1959 to suspend territorial claims for 30 years so the continent could be reserved for scientific research.

The meeting—and others that will follow in London next year—was called to work out a set of international procedures to be applied when governments or multinational corporations feel there is sufficient economic incentive to tap the continent's mineral wealth.

"This is not for tomorrow," a Western scientific analyst said, "but should the time arise, all signatories to the Antarctic convention feel it best to have an agreement prescribing the conditions."

The issues are ecological, legal and political—all of such sensitivity that the 12 countries, including the United States and the Soviet Union,

decided against issuing any communiqué or even signaling the presence of their representatives in Paris.

Technical experts, supported by diplomatic personnel, were gathered at the Paris conference center on the Avenue Kleber, near the Arc de Triomphe, for two weeks. The head of the American delegation was Dr. Robert Hughes of the National Science Foundation in Washington, the agency responsible for scientific policy questions.

It was described as a special preparatory meeting to examine all questions of mineral resource activities in Antarctica before a higher-level consultative meeting of the nations that signed the treaty takes place in London toward the end of next year.

Because of the complexities of the issues, a further preparatory meeting was scheduled in London before what would be the ninth consultative gathering of the treaty nations. They have met every two years since 1959.

At the eighth consultative meeting in June 1975 in Oslo, the governments agreed to study the questions of minerals in the Antarctic in light of the

quadrupling of oil prices in 1974 and the speed of technological advances in cold-weather extraction procedures.

No one knows how much oil, coal or other minerals the Antarctic might contain. In view of discoveries above the Arctic Circle in the North, in Canada and Alaska, the amounts could be considerable.

The United States Geological Survey has reported the existence of possible oil-bearing strata in Antarctica. There is no corresponding land mass in the North.

The signatories to the 1959 convention are the countries that maintain permanent stations in Antarctica for scientific research: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, Britain and the United States. In addition, 20 or so countries maintain temporary stations during the Antarctic summer.

Because Antarctica represents a stable platform free from noise and pollution, scientists are able to place instruments

there for such sensitive jobs as charting rays from space or recording data that may explain mysterious characteristics of the South Magnetic Pole.

Although some treaty signers—Argentina, Chile, Australia, Norway and Britain, for instance—have laid claim to Antarctic territory, the 1959 convention in effect froze all claims for three decades to make the continent a haven for international scientific cooperation.

By trying to establish agreed procedures, the treaty nations are now seeking to check any future land grab that could be disastrous for world stability and ecological balance, analysts said here.

Musk Ox Outwits Wolves

MOSCOW (AP)—A musk ox that escaped from its pen on Taimyr Peninsula apparently outwitted wolves through the long polar night and returned unharmed, according to the official press agency, Tass.

Scientist: Giant Crater Lies Under Antarctic Ice

An Indiana scientist has found indirect evidence of a 150-mile-wide crater near the South Pole, the result of what he believes was the largest meteorite ever to strike the Earth.

"We now have evidence that a crater comparable to the largest craters which exist on the moon exists on Earth," Dr. John G. Weihsaupt, associate dean of science at Indiana University-Purdue University-Indianapolis, told the 25th International Geological Congress in Sydney, Australia. Details of the discovery were released by university officials in Indianapolis.

A crater a half-mile deep and 150 mile wide lies beneath the ice of northern Antarctica, according to his evidence. The crater would have been formed by a meteorite two-and-a-half to three-and-three-fourths miles across, weighing 13 billion tons, which hit the Earth at a speed of 44,000 mph between 600,000 and 700,000 years ago, by his calculations.

It is four times larger than any other meteorite crater so far found on Earth, a crater nearly large enough to fill the space between Chicago and Indianapolis. The evidence indicated that the impact, although huge, lacked force enough to change the Earth's axis or rotation, Weihsaupt said. Aug. 22

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The Polar Times

Published June and December by the
AMERICAN POLAR SOCIETY,
August Howard, Secretary,
98-20 62nd Drive (Apt. 7H),
Rego Park, New York 11374
AUGUST HOWARD, Editor

THE POLAR TIMES highly recommends "The Polar Record," published by the Scott Polar Research Institute, Cambridge, England.

The American Polar Society was founded Nov. 29, 1934, to band together all persons interested in polar exploration. Membership dues are \$2.00 a year or \$5.00 for 3 years, which entitles members to receive THE POLAR TIMES twice a year.

Back issues, No. 1 through No. 77, if available are 50 cents each. Issue 78 and onward are \$1.00.

The American Polar Society is classified as a tax exempt organization under Code Section 509 (a) (2).

Antarctic Ice Defeats Its Drillers

By WALTER SULLIVAN

The New York Times

ROSS ICE SHELF, Antarctica, Dec. 14—The bold effort to drill more than a quarter of a mile through this apron of floating ice into the "lost world" sea beneath it has been choked to death.

Early today, with only 27 hours of drilling left before breaking through, the drillers lost their race with inexorable closure of the hole. Like a nightmarish room whose walls close in and crush its occupants, the ice flowing under the pressure of its own weight to fill the hole locked the drill assembly in a fatal grip during a half-hour change-of-shift stoppage.

Thus, for this year, hopes have been dashed for reaching the sunless sea that lies beneath this ice and observing what specialized creatures live there.

Scientists had hoped to penetrate the thick ice so that they could examine the nature of water and life processes existing in complete and perpetual darkness. They had planned to explore the origin of the so-called "Antarctic bottom water," which creeps north along the floors of the world oceans and is indirectly responsible for much of the world's oceanic food.

The drillers were working two 12-hour shifts while an international consortium of two dozen or more scientists waited at the main McMurdo Sound base for the breakthrough. McMurdo is 470 miles northwest of here. Having come from as far afield as Japan, Norway, Denmark, Switzerland, Australia, Germany and the United States, they will now have to devise other research projects to justify their journeys or return home.

"We blew it," said B. Lyle Hansen, perhaps the most experienced specialist in ice drilling. With a wan smile that sought to disguise his deep disappointment, he blamed his own "miscalculation" of closure rates.

For the last week, however, it has been clear that the race with closure would be a close one—that drilling of a dry hole, with no fluid inside it to counter the pressure of closure, had emerged as the only way a penetration could be obtained this season. It is now summer in the Southern Hemisphere.

Since glacier ice flows in a plastic manner, it squeezes in on a hole to an increasing extent at greater and greater depths. On continental ice sheets where Mr. Hansen has drilled east of here in Marie Byrd Land and in Greenland the ice remains cold and stiff at depths. But here as the drill hole approached the sea beneath the ice, the latter was warmed by the nearness of water and flowed more rapidly.

The hole, 12 inches in diameter, was closing this morning at an estimated three-eighths of an inch per day.

It was unusually large to permit scientists to lower television cameras, baited traps, nets, a sea-floor coring device and other equipment into the ice-covered sea. The latter is about the size of Spain and its water depth beneath the ice here is 780 feet. Probably for millions of years this sea has been cut off from sunlight. However, it exchanges water with the Ross Sea—the southernmost extension of the Pacific Ocean.

Life Without Sun

It is assumed that life forms adapted to this sunless environment have evolved to live there. Observing specimens with television and capturing some was one of the project goals. The drilling was part of a broader study known as RISP, for Ross Ice Shelf Project.

The shelf is considered by some scientists the key to the stability of the vast ice sheet covering Marie Byrd Land. Whenever the shelf breaks up into icebergs, they say, the Marie Byrd Land ice slips into the sea, raising world sea levels some 20 or 30 feet. The drilling halt will not affect other aspects of the project in which observations of ice behavior and other phenomena are being made at a half-dozen widely scattered campsites on the shelf.

Mr. Hansen and the chief driller, John Rand, are already laying plans for a new effort next year, probably with an eight-inch hole filled with a mixture of diesel oil and trichloroethylene.

The weight of this fluid in the hole would be kept below the level of sea water pressure beneath the shelf so that when the breakthrough occurs the mixture will be pushed up and out of the hole instead of polluting the sea. Such pollution could invalidate a number of planned studies, including analysis of the sea water for trace components.

Officials at Scene

Mr. Rand is with the Army's Cold Regions Research and Engineering Laboratory in Hanover, N.H., with which Mr. Hansen was also associated until he went to the University of Nebraska at Lincoln, which is coordinating RISP. The project is funded by the National Science Foundation, whose chief of polar programs, Dr. Robert H. Rutford, was here today and heard the disappointing news. Another visitor was J. William Middendorf 2d, the outgoing Secretary of the Navy.

In plans for coping with the hole closure, a variety of strategies were devised. Periodically the drill bit was used to ream out the hole to its proper width. Also, the bit was collapsible. Normally it fitted together snugly, but when stuck it could be struck a sharp blow, breaking it up, as Mr. Rand put it, "like a Chinese jigsaw puzzle." When thus disassembled each piece could be hauled to the surface by lanyards attached for that purpose. Also detachable were the stabilizers—metal blocks positioned around the shaft to keep the bit centered.

Repeatedly, during the 10 days of intensive drilling, including yesterday, these components came apart spontaneously and had to be fished out with mag-

Cool Flight For Penguins

Reuter

CHRISTCHURCH, New Zealand, Nov. 24—Nearly 150 penguins flew in comfort to the United States today aboard a U.S. military freight plane in a regulated temperature of 23 degrees.

They were accompanied by 15 scientists and one serviceman huddled in protective polar clothing for the long trip to California.

The 100 Adelle penguins and 40 Emperor penguins were flown in to Christchurch last night from New Zealand's McMurdo Base in the Antarctic. They will be used to establish a breeding colony at California's Sea World Aquarium. Last December 100 Antarctic penguins, also destined for Sea World, died in San Diego as a result of an electrical fault in a refrigeration system.

nets. Today the hole got a stranglehold on the entire assembly so tight that nothing could be done. By lowering a charge of dynamite 1,089 feet to the bottom and blasting off the drill assembly, it may be possible to salvage the drill pipe.

The pipe used here, in contrast to the heavy pipe used in drilling on land, is so light that each section of it can be lifted with one hand. It is largely made of fiber-glass.

When drilling with a fluid the pipe is circulated to remove the ice chips, but with the dry hole method the chips were sucked out by a vacuum system. It was planned in the next day or two, when within six feet of the bottom of the ice shelf, to fill the hole with water—which was being kept in reserve—so that when sea water burst into the hole it would not blow the drill sky high.

A wire was to be lowered to the bottom through which an electric current would be driven to keep the water from freezing. This will presumably be done next year because it should make possible reuse of the hole a second season.

To test the feasibility of reopening the hole an artificial "icicle" three feet in diameter and 200 feet long was built at the laboratory in New Hampshire. This was done in a refrigerated tent 200 feet deep. A wire similar to the one here was lowered and frozen into the water filling the pit. When the current was turned on the wire came free in 40 minutes and within three hours had melted a hole 20 inches in diameter.

According to Mr. Rand, next year's proposed eight-inch hole would be big enough for the television camera, microphones to eavesdrop on the communication between creatures under the ice, and other instruments. Some of the various devices, however, will have to be redesigned.



The New York Times/Walter Sullivan

A view of the J-9 field station on the Ross Ice Shelf in Antarctica. Drilling rig can be seen at right.

Ice in Antarctica Found to Wax and Wane

By WALTER SULLIVAN

Evidence is accumulating that the ice sheets covering Antarctica, far from being permanent features, wax and wane in ways that at times must cause large changes in global sea level.

Dr. Robert H. Thomas of the University of Maine, who is now making measurements on the Ross Ice Shelf there, reports that where the main stream of ice flows into that shelf from Marie Byrd Land the ice is thickening at a rate of three feet a year. In the heart of Marie Byrd Land, it seems to be thinning at a rate of 16 inches a year.

If, in fact, these are indications that the inland ice is slipping seaward, it could significantly raise world sea levels at some time in the future.

Although the chief effort to fathom what is occurring, by an attempt to drill through the Ross Shelf and probe the sea floor beneath it, has been frustrated, a wide range of other studies are under way. The drill was immobilized last week when flowing ice compressed the hole it was drilling.

Plan to Free Drill

On Wednesday word came from the project camp on the shelf that a plan had been devised to free the drill next year by circulating hot water down the drill pipe. The pipe will be left in place through the next Antarctic winter, which coincides with summer in the Northern Hemisphere.

The hot water method would avoid the need to drill a new hole. After the drill is extracted, heat would also be used to penetrate the remaining 300 feet to the bottom of the shelf, 1,375 feet thick, which floats on 780 feet of water.

To assess movements and changes in strain within the ice shelf, which is as large as Spain, air-lifted crews are estab-

lishing 85 new survey points in a grid covering the entire shelf.

These will bring to 178 the number of such sites. Periodic resurveying, using the Navy satellite navigation system, should indicate what motions and distortions are occurring.

As noted last week by Dr. Richard Cameron, head of glaciological programs within the National Science Foundation, which funds the program, conditions within the shelf seem to be changing with remarkable speed. Areas that were smooth when Roald Amundsen crossed it on the way to the South Pole in 1911-1912 and when Dr. Laurence Gould did so in 1928-1929 now seem heavily crevassed and once-crevassed areas are

smooth.

This may mean that parts of the shelf are aground that previously were afloat and vice versa. As worldwide sea levels rise, the floating shelf is lifted higher. But as the load of ice on Antarctica lightens, the land beneath it rises, the two effects thus being in competition with one another.

Dr. Terence J. Hughes of the University of Maine believes that if the ice becomes buoyant much farther inland than at present, the entire Marie Byrd Land ice sheet will disintegrate, raising the seas some 20 feet.

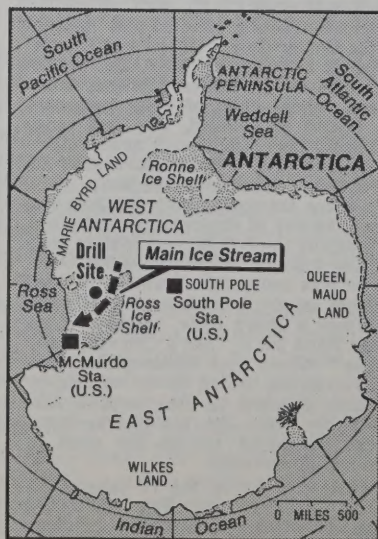
To see if the grounding line where the shelf meets the land-borne ice is moving inland, a demilitarized form of artillery has been brought to Antarctica. It consists of a mortar modified so that it does not qualify as a weapon (since the treaty on Antarctica forbids military activity on the continent).

Tests and Shear Waves

Shear waves (like those in a shaken rope) will be generated by this device to record where the shelf is grounded and whether those locations are migrating. A group led by Dr. Charles R. Bentley of the University of Wisconsin is making precise gravity measurements on the ice to see to what extent the land underneath is unstable and probably rising.

Last year Soviet scientists succeeded in drilling two holes through the apron of shelf ice attached to the Princess Astrid Coast of Queen Maud Land, on the opposite side of the continent from the Ross Shelf. One penetrated 1,171 feet of ice at a point 22 miles in from the seaward edge. The other, drilled 30 miles from the edge, penetrated 1,466 feet.

Bottom sediment was obtained through the first of these holes. The latter were



The New York Times/Dec. 27, 1976

Soviet Team Finds a 'Mountain of Iron' in Antarctica

By WALTER SULLIVAN
The New York Times

McMURDO SOUND, Antarctica, Dec. 15 —In the Prince Charles Mountains, near the coast of Antarctica facing the Indian Ocean, Soviet explorers have found what one American geologist here described today as "a mountain of iron."

Discoveries of iron at other locations on this continent, chiefly by Soviet reconnaissance parties, have also hinted at sizable deposits elsewhere.

Meanwhile, an airlift from this base has landed a United States Geological Survey party of six, including two women, at a site known as the Enchanted Valley to study a formation that, it is suspected, may prove to be one of the most important ore-bearing structures in the world.

It is a body of rock in the Pensacola Mountains whose area is estimated as at least 13,000 square miles, with a thickness of four miles. While it is partly covered by ice, it is extensively exposed in that part of the mountains known as the Dufek Massif.

The formation was first reached by explorers in 1957, and an initial study was carried out in the southern summer of 1965-1966. It proved to be a layered structure produced by eruptions from the earth's interior, with striking similarities to some of the most productive formations in the world. Among them are the Bushveld complex in South Africa, the Stillwater formation in Montana and the

less than five inches in diameter compared to 12 inches for the Ross Shelf hole, which is intended to accommodate a television camera, baited traps and other devices.

The last-named hole, being hundreds of miles from the open sea, would penetrate an area so remote from sunlight that specialized life forms may exist there.

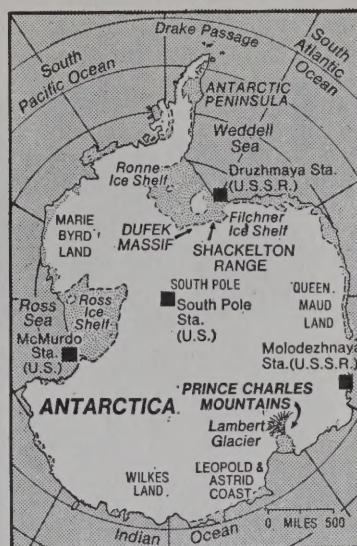
To sample ice layers through the full depth of the Ross Shelf, American drillers several years ago penetrated close enough to the bottom to encounter salt water. This was near Little America, where the shelf is relatively thin.

International study of the Ross Shelf has been under way for several years. To chart its thickness, United States Navy planes have carried a British radar device more than 22,000 miles in flight lines crisscrossing the ice. This has confirmed that the swiftest-flowing stream of ice is also the thickest.

Like the central current of a river, it flows far more rapidly, some three feet daily, than more stagnant areas on either side.

While most of the concern is for stability of the West Antarctic Ice Sheet—that which covers Marie Byrd Land—an international study is also aimed at the far larger East Antarctic Sheet. W. F. Budd of the Australian Antarctic program believes both of these ice sheets "surge" in a cyclic manner.

He has sought to analyze numerically the factors that control the flow of glacier ice toward the sea. Some glaciers he finds, are slow, some are fast, and



The New York Times/Dec. 19, 1976

Sudbury region of Ontario.

Focus of Geologic Effort

These areas have yielded important deposits of platinum, nickel, copper and chromium. The Bushveld has also produced lead, zinc, vanadium, iron, cobalt and some tin and gold. The Dufek Massif is now considered one of the largest such layered complexes in the world and is the chief focus of the current American

some remain relatively stagnant until there is a critical level of accumulation, whereupon they surge, moving rapidly to sea.

Flow of Glacier Ice

Dr. Hughes, in this regard, cites the Jakobshavn Glacier that drains more than 10 percent of the Greenland ice and flows more than four miles a year. He believes that when land beneath the ice is well below sea level, a "calving bay" can form in which icebergs rapidly break off, or "calve."

Such a bay, it is proposed, can eat swiftly into a continental ice sheet. Some scientists believe this process cleared ice from central Canada within a few decades or centuries some 8,000 years ago.

Dr. Budd regards East Antarctica as just beginning to recover from its last surge, such events occurring every few tens of thousands of years. Dr. Thomas likewise believes West Antarctic ice reached maximum thickness 2,000 years ago, after 25,000 years of accumulation, and then began draining.

Ice extracted from the bottom of a drill hole at Byrd Station, in the heart of that region, proved to be 27,000 years old. Dr. Thomas believes it was formed from snow that fell there when almost no ice covered the region—that is, right after a surge.

Such massive discharges of ice into the seas would have a radical effect on climate. It is even being suggested that the Antarctic ice has a life cycle of its own that, instead of being caused by ice ages is actually responsible for them.

geologic effort in Antarctica.

The party there is led by Dr. Arthur B. Ford of the geological survey. It is hoped he can also be airlifted to join a Soviet party searching for minerals in the Shackleton Range 300 miles to the northeast—possibly a similar formation. Basic funding of the project is by the National Science Foundation.

While no important uranium deposit has yet been found in Antarctica, the Japanese have located a small amount of uranium ore (euxenite) near Lutzow-Holm Bay. Radiation detectors are also being carried by helicopters from the American base here to search nearby mountains for radioactive deposits.

These developments are bringing about a profound change in the status of Antarctica. The possibility that, as some had hoped, it might be preserved as forever pristine—a "world park"—becomes increasingly unlikely. International agreement on management of its resources has at the same time become more urgent than ever before.

Exploration of Mountains

Details of the Soviet-reported iron deposit in the Prince Charles Mountains are not yet available. However, Dr. Edward S. Grew of the University of California at Los Angeles is working with the Russians, and through him more should eventually become known. He has spent a winter at their Molodezhnaya base and is now at their summer camp, known as Druzhnaya near the former Argentine station, General Belgrano, on the Filchner ice shelf.

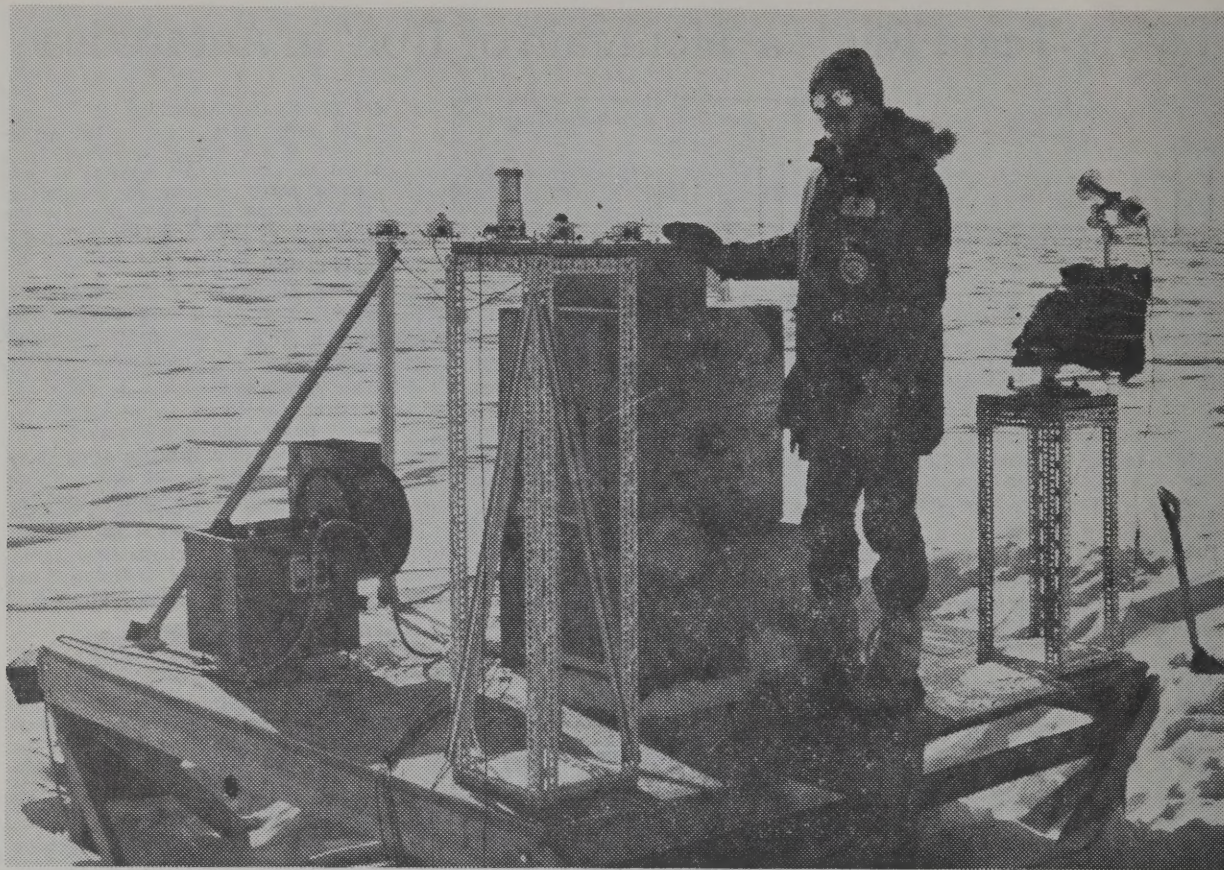
Exploration of the Prince Charles Mountains was from a temporary camp

on the Amery Ice Shelf where the Lambert Glacier, the world's largest such feature, reaches the sea. To the east of there,

scattered along two or three hundred miles of the Leopold and Astrid Coast, are boulders as much as six feet in diameter formed of iaspilite, a banded iron ore. They clearly have been carried there by ice flowing over a large ore body buried somewhere inland.

At several places in Queen Maud Land, such as at Mount Humboldt, iron ore (25 percent or more magnetite) occurs in pods more than 300 feet thick. Such finds have led Soviet geologists to be optimistic about discovering a major deposit. Dr. Ford has reported layers of rock in the Dufek Massif some several yards thick and containing 70 to 80 percent of magnetite.

In an analysis of the meager information as yet available on mineral resources of the Antarctic done for the United States Geological Survey, Dr. N. A. Wright and Dr. P. L. Williams emphasized the obstacles to exploitation. About 98 percent of the continent is covered with ice. Access to its coasts typically is blocked by pack ice. Since the continental ice is usually in motion, a shaft sunk through it would soon be displaced from a formation in the rock below.



The New York Times/Walter Sullivan.

Brad Halter of the National Oceanic and Atmospheric Administration tends radiation monitors on the South Polar Plateau. Each egg-size dome on the stand in front of him records energy from the sky in different wavelengths.

Antarctica: Glitter, Rays and Shifting Pole

By WALTER SULLIVAN

The New York Times

SOUTH POLE STATION, Antarctica—The most striking sight when one steps out of an aircraft here on a typically sunny day is not the endless white plain of the South Polar Plateau or the high, snow-dusted dome covering the American outpost. It is the glitter of the air.

Anyone who loves snowscapes knows how they glitter, but to have the air itself do so is a special wonder, and one of the research efforts here is aimed at learning the source of the rain of ice crystals responsible for it.

This "clear air precipitation" produces a considerable part of ice accumulation on the polar plateau. It falls almost constantly in the winter night and from 50 to 75 percent of the time in the constant daylight of summer. A laser probe, aimed directly upward, is being used to trace the origin of the crystals.

The project is one among a wide range of research efforts here, most of which are directed at the special circumstances of this site on an icy plateau more than 9,000 feet above sea level and at the southern end of the earth's spin axis.

The cosmic ray monitor being installed here, for example, should be the world's most sensitive recorder of high energy radiation showers from the sun. Its three modules, known as neutron monitors, weigh 5,500 pounds each.

The "rays" are actually high energy particles. Observing the direction of their arrival, after following magnetic "highways" from the sun, should help reveal the magnetic structure of space between sun and earth.

Scientists here are taking advantage of the station's remoteness from local sources of pollution to record long-term trends in composition of the atmosphere. Targets of the measurements include dust, ozone, fluorocarbons (such as those used in some spray cans) and carbon dioxide.

The percentage of carbon dioxide in the air has increased steadily since the industrial revolution introduced large-scale burning of fossil coal, oil and gas.

Also under investigation is the role of this, the world's great icebox, in controlling weather and climate changes elsewhere on the planet. Since the Antarctic is a continent buried under ice one to three miles thick, it carries 95 percent of the world's semipermanent ice,

The North Pole region is a sea covered with drifting ice floes only a few feet thick, the only substantial ice sheet there being on Greenland.

Isolation and Infection

In addition to the investigations of earth, ice and sky, the camp medical officer, Dr. Fritz Koerner, is studying fellow occupants of the station. His prime interest—and that of his supervisor, Dr. Harold G. Muchmore at the University of Oklahoma Medical College, concerns the effect of prolonged isolation on the body's ability to resist infection.

It has often been observed that when a party that has wintered in the Antarctic comes in contact with outsiders there tends to be an epidemic of colds. It is suspected that those in isolation have lost much of their immunity to germs other than those currently inhabiting the group.

It has also been suggested that in such circumstances the immune system itself—its ability to rally against an invader—is weakened for lack of challenges. Drs. Koerner and Muchmore suspect that this is invalid.

According to Dr. Koerner, a Navy study has shown that in nine months the white blood corpuscle count of those at the pole station dropped from 5,000 to 2,500 per

cubic centimeter. But, he says, it would have to fall below 500 to imply a serious deficiency. The white corpuscles attack invading organisms.

The study is continuing and suggests an increase in susceptibility to some virus infections. However, Dr. Koerner says he will not be surprised if basic weakening of the immune system during isolation "turns out to be just an old wives' tale." The study is sponsored by the Oklahoma Medical Research Foundation.

The camp here is itself operated by the California concern of Holmes and Narver and is supported by a Navy airlift. Both operations are performed under contract with the National Science Foundation.

Among the special observational features of this spot are the absence of tidal stresses that otherwise affect gravity measurements and the total lack of regional earthquakes.

Unlike most other continents, Antarctica is not being squeezed or undercut by neighboring plates of the earth's ever-changing surface and is therefore free of local earthquakes. This makes possible highly sensitive recording of such activity elsewhere.

James Fletcher of the United States Geological Survey is operating three long-period and three short-period seismographs forming part of that agency's worldwide network of standard earthquake monitoring instruments.

The scientific leader of the station for the coming year, Tadashi Yogi, is operating two gravity meters for the University of California at Los Angeles. This location, on the earth's spin axis, should make it possible with these instruments to see whether, as suspected, the earth's inner, solid core sloshes back and forth inside the molten core after a great earthquake.

Holes are being drilled into the ice in which special plumb lines will be suspended to record otherwise imperceptible changes in the tilt of the ice sheet. These would occur if the entire earth oscillates, like a ringing bell, when jostled by a big quake.

Since the top of the ice sheet flows faster toward the sea than the bottom, this will cause a slow, steady change in the tilt of the plumb-bob hole, which must be allowed for in the observations.

An essential part of the weather and climate studies is assessing the transfer of energy between the air or sky and the ice surface here. Much of the energy that the earth receives from the sun in warm latitudes is later lost to space from the polar regions and subtle changes in this process can have a profound effect on climate.

The study is being done by a group from the University of California at Davis. Data recorded constantly by a wide range of instruments is transmitted to a computer center in the station for storage and analysis.

The cosmic ray monitors, operated by Stewart Harris for the Bartol Research Foundation of the Franklin Institute in Philadelphia, replace a smaller unit here. Because force lines of the earth's magnetic field are close to vertical at the pole, the cosmic rays—charged particles from the sun—can plunge earthward without magnetic interference.

An added advantage is the 9,000-foot

Meteorites Found on Antarctic Ice Offer Science New Clues to Study

By WALTER SULLIVAN

The New York Times

BETHLEHEM, Pa., Oct. 20—Within a radius of a few miles in Antarctica, Japanese scientists have found, spread across the ice, more than 1,000 meteorites of diverse types. The discovery is believed to be without precedent and the Japanese say no ready explanation is known.

There have been meteorite falls in the past that showered the landscape with fragments, but the Antarctic discovery consists of numerous kinds of meteorites that presumably fell successively over a prolonged period. It is estimated that the earth, including its oceanic areas, receives about one meteorite a day.

The Japanese find was described in an interview here today by Dr. Masako Shima, whose husband collected some of the specimens. Dr. Shima also discussed the finds at the annual meeting of the Meteoritical Society being held here at Lehigh University. The society is an international association of specialists in meteorites and related subjects.

The meteorites found on three successive Japanese expeditions lie near the Yamato Mountains, inland from the Japanese Showa Base. The first nine specimens were found in 1969. Dr. Shima said that she had studied four of them and that all were of different types.

In 1974, an expedition discovered a rich field with 663 specimens, ranging in size up to 12 pounds. Last year, 330 more were found. The discoveries of all three expeditions lay within two squares close to one another and each six miles on a side.

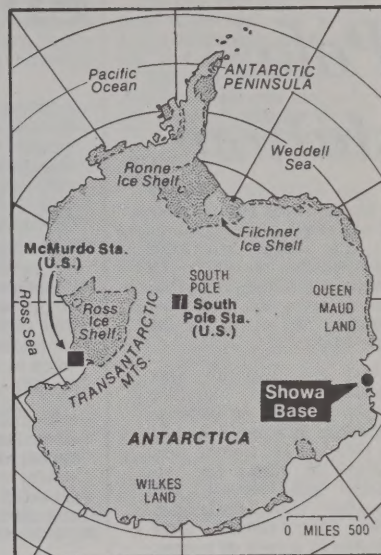
According to Dr. Shima, who is with the Max Planck Institute for Chemistry in Mainz, West Germany, only one of the specimens is an iron meteorite. The rest are stones or of other types such as carbonaceous chondrites.

Dr. Edward Olsen, meteorite specialist at the Field Museum of Natural History in Chicago, plans to visit Antarctica this December, when summer begins in the Southern Hemisphere. He hopes to find specimens on the side of that continent opposite the Japanese base.

Antarctica is ideal for such collections, he pointed out in an interview here, because the black specimens stand out so clearly against a white background. He suspects that past estimates about the relative abundances of various kinds of

altitude, which minimizes filtering of the particles by the atmosphere. For reasons not fully understood the South Magnetic Pole has been migrating toward Australia. In the past half century it has moved from the interior of Antarctica to a point off the coast. To what extent this has altered cosmic ray paths is not clear.

Laser probing of the ice crystals indicates that they tend to form 2,600 feet aloft and grow as they fall. The observations are being made by Bruce Morley and Evan Neveroske of the University of Nevada's Desert Research Institute.



meteorites have been grossly biased because the irons and other clearly "foreign" types stand out among terrestrial rocks. Those that look like ordinary rocks tend to be overlooked.

For this reason, as pointed out this morning by Glenn I. Huss of the American Meteorite Laboratory in Denver, Colo., a situation like that in the Yamato Mountains, where only objects that have fallen from the sky are found, offers a special opportunity to identify new types of meteorites. He noted that even where falls have been recorded by camera networks the objects often have not been found. The Yamato collection also offers an unusual opportunity to determine the true distribution of types.

This would bear directly on arguments as to where meteorites come from—to what extent from shattered asteroids, from material that condensed as the solar system was forming or from material that predated the formation of that system.

One explanation of the Yamato collection, Dr. Olsen believes, may be that for thousands or millions of years ice from the Antarctic interior has been flowing toward the mountains until blocked by them.

There, according to his hypothesis, the ice was steadily removed by evaporation, sublimation or wind action. Any meteorites that fell on the ice during its long slow journey toward the mountains might then have accumulated on its surface.

In Antarctica, he hopes to find a similar situation in the "dry valleys" west of McMurdo Sound, as for example, at the end of the Taylor Glacier. The snout of this glacier has remained at the same location for many decades or centuries, since the ice was dissipated as fast as it advanced. Dr. Olsen plans to take along a mine detector to help in the search.

If feasible he would also like to look farther inland near Mount Dewitt, where the situation seems comparable to that in the Yamato Mountains.

Fires at South Pole station

Nov. 30

Fire, one of the hazards most feared in the Antarctic, has twice struck the Construction camp 400 metres from the new geodesic dome at the South Pole Station.

One jamesway hut was destroyed and another partly damaged on October 30, and a third hut damaged on October 31. No-one was injured in either fire, although some personal belongings were destroyed. Both fires started after failures in a type of heater.

One of the most fortunate persons at the camp is the cook, Mr W. Nunes. He had placed money, traveller's cheques, family photographs, and his passport in his personal cookbook. After the fire he found the book charred, but his money and documents were not damaged.

The old construction camp where the jamesways were located was built several years ago by United States Navy seabees for use while the geodesic dome complex was under construction. Since then the camp has been used to store supplies, serve as a back-up camp in case of fire at the new South Pole Station, and to provide accommodation when the dome is full. A jamesway is a wooden frame and canvas building 18m long used for Antarctic field camps.

The fire was kept secret, even after the 18 who wintered at the Pole Station — among them two New Zealanders — returned home.

When the fire on October 30 occurred, nine men were working at the jamesway complex. One man was inside the jamesway galley when the fire started. He heard a crackling sound, and found the fire. Despite his attempt to extinguish it it spread rapidly. The man ran through the building to make sure no-one was trapped.

The men affected by the fires were temporarily

Winter at South Pole enlivened only by work

Nov. 19

Winter at the South Pole Station could be very boring, which was why the men based there tended to become very engrossed in their work, said Mr B. Maguire in Christchurch yesterday.

Mr Maguire of Wellington, is one of the first two New Zealanders to spend a winter at the South Pole. He said it was quite common to work 18 hours a day and for as much as 30 hours at a stretch at the Pole.

In emergencies, such as when the British climbers disappeared on the Palmer Peninsula, weather reports were provided for up to 57 hours at a stretch to help searchers

and aircraft.

Eighteen men spent last winter at the Pole Station — 16 Americans and two New Zealanders — the other New Zealander being Mr B. Potter of Himintangi.

Mr Maguire said that life under the geodesic dome at the station was fairly comfortable, although there was a panic once when a carbon dioxide fire extinguisher system automatically went off in the power house.

The power was off for an hour and the temperature in the building in which they were housed dropped by 10 degrees.

While at the station the two men ran a meteorological programme, sending up 12ft diameter weather balloons to 110,000ft in temperatures 70 degrees below zero.

Hourly weather observations were taken for the benefit of aircraft, and six-hourly synoptic observations were also made. The results had to be sent by radio to Melbourne.

Once a month measurements had to be taken from stakes in an open area two kilometres from the station, to check levels of snowdrift. This task, said Mr Maguire, could require men to stay as long as an hour outside the dome, and this could be "pretty tough."

Normally it took 30 minutes to get dressed to go outside. "When breathing outside the dome one's breath goes straight up your face, and it is not uncommon for the eyelashes to stick together," said Mr Maguire.

Other problems for the

men at the Pole Station were headaches and nose bleeds throughout the year. Bleeding from the mouth and the ears also occurred because of the effect of the altitude of the station on the blood.

Mr Maguire, who arrived in Christchurch two days ago, was wearing a wind jacket which bears the badge "South Pole winter over 1975-76." He said only 18 were made.

He said he was pretty sure that an agreement would be signed between the New Zealand Meteorological Service and the United States authorities to enable New Zealanders to work at the station in future years.

Hercules due out by Christmas

Dec. 22

The third, and last, ski-equipped United States Navy Hercules to be repaired at the Dome C camp in Wilkes Land is expected to be flown to Williams Field, near McMurdo Station, by Christmas.

A report received at the United States Navy base at Christchurch Airport — the fortieth day of activity at the Dome C recovery camp — said all important repair work had been completed. Checking of all systems inside the plane began yesterday.

On Sunday night Mr J. Herman, a civilian from the United States Naval Air Systems Command, flew from Christchurch on his way to the camp. It will be his responsibility to check that the Hercules is capable of flying again.

It is expected that provided there are no last minute problems the Hercules will fly to Williams field today or tomorrow.

As many as 48 people have been working at the camp since late October. On Monday 14 of them left for Christchurch and ultimately Christmas at home in the United States.

Four for a bed

Bad weather at McMurdo Station recently caused three United States Navy ski-equipped Hercules aircraft and a British Antarctic Survey Otter to remain overnight at the South Pole Station.

The effect of this was to increase the normal station population of 16 to more than 100 for the one night.

One of the Hercules having delivered fuel to the Pole Station, was airborne for McMurdo Station when reports of a bad storm and high winds there caused the captain to turn back to the Pole Station.

Two other Hercules returning from Siple Station had landed at the Pole to refuel. Because of the bad weather at McMurdo Station, they decided to remain there.

The fourth plane, the Otter used by the British Antarctic Survey to support the Ross Ice Shelf project, was on its way from Canada to McMurdo Station. It, too, decided to wait at the Pole for the McMurdo storm to clear.

Dec. 1

housed under the geodesic dome, and within two weeks United States Navy Hercules from McMurdo Station had flown in men and materials to repair or replace everything that had been damaged.



MR MAGUIRE



HEADING SOUTH FOR WINTER — The icebreaker Fuji left Harumi Pier in Tokyo for Japan's Showa Base in the Antarctic Thursday morning with the 40-member 18th Japanese Antarctic Observation Team on board. The ship, manned by a crew of 182, is scheduled to arrive at the Antarctic waters around Dec. 30 after stopping in Fremantle, Australia, for refuelling. It will then start airlifting supplies to Showa Base on Ongul Island. The ship is scheduled to leave the Antarctic waters late in February with the 29 members of the 17th wintering team.

The chief undertaking of the 18th observation team will be to engage in observation of the upper strata through the launching of rockets. It also will conduct a survey on Antarctic krill, a type of large plankton, in order to obtain basic data on development of sea resources in the Antarctic. Nov. 25

Japanese and Soviets fishing for krill

BUENOS AIRES (AP)—The antarctic krill could become a regular feature on the menus of ordinary restaurants around the world in the not-too-distant future.

The krill is a shrimp-like crustacean measuring less than two inches long found in great abundance in the Antarctic Ocean, mainly south of the South American continent, according to Argentine scientists. The word krill is Norwegian and means young fish.

They say it has a high protein content and may turn out to be one of the world's most important food sources in the future if and when current ones run out.

Japanese and Soviet trawlers reportedly are already fishing for krill in waters around the south polar ice cap.

The Buenos Aires newspaper, *La Opinion* said recently that West German Scientific Research Minister Hans Matthöfer last year served a meal that included cream soup of krill.

La Opinion said the West Germans got the krill during a

scientific research mission to Antarctica in late 1975, the first West German antarctic mission since World War II.

A few weeks ago, the Argentine Antarctic Institute published a study called "The Krill and Its Importance" that dealt with concentrations of the crustacean in the Argentine portion of Antarctica.

It also urged a "rational" exploitation of krill deposits to avoid damaging the ecological balance of Antarctica. The study said antarctic fauna, such as penguins, seals, whales and fish, ate the crustacean to survive.

The study said the Soviet Union, Japan and West Germany were the first industrialized countries to realize the importance of krill and have begun research and experimental fishing. July 26

Surviving a storm

SCOTT BASE (PA). — Winds of more than 100 kmh last week struck a Victoria University field party camped in polar tents on the ice of the Taylor Glacier, in the first storm of the Antarctic summer.

With the party was surveyor Bill Wicks, of Dunedin, whose work was completed before, he flew out in the first helicopter able to reach the party after the storm. At Scott Base yesterday he gave the first account of the damage.

Mr Wicks said that the party thought they were "just in for another blow" and were prepared to sit it out.

"Then someone went outside and saw an 1100kg motor toboggan, sledges and equipment overturn and scatter across the glacier," he said.

"We put in extra ice

screws and tied everything down. It was too windy to stand up."

The five men had an early meal in one tent, only to discover afterwards their other tent had ripped in the wind.

"The outer lining had torn, leaving a hole one metre by two metres," said Mr Wicks, "and there was a tear in the bottom seam of the inner lining."

"The tent was filling with fine snow and the others couldn't block it, so they came in with us. That made five of us in one polar tent, with wind gusts of up to 150 kmh."

"We went to bed fully clothed and tied our boots to our sleeping bags in case the tent tore, blowing equipment away."

U.S. Navy helicopters battled high winds for three days before they could fly a replacement sledge and tent to the party. Nov. 17

Scientists pinpoint the South Pole

Using navigational satellite signals, scientists last week made the most precise location of the South Pole yet made.

The exercise of locating the exact position of the pole was carried out for the benefit of a group of American scientists who were visiting the Antarctic.

Among the visiting scientists was Mr R. H. Lyddan head of the topographic division of the United States Geological Survey.

Mr Lyddan described yesterday how two men from his organisation are using a modern survey device to take readings from navigational satellites to determine exact positions at the pole and other places in Antarctica and measure ice movements.

The purpose of the measurements is to determine

the rate at which the ice is moving and the direction of its movement at the South Pole.

Mr Lyddan said scientists were "rather confident" that the ice at the pole was moving at the rate of about 10 metres a year. The direction was erratic but it was generally toward the Weddell Sea in the direction of Rio de Janeiro. Nov. 23

Cargo flown to Antarctic

The cargo yard at the United States Navy establishment at Christchurch Airport is today virtually empty — practically all of the cargo having been flown to the Antarctic in near-record time.

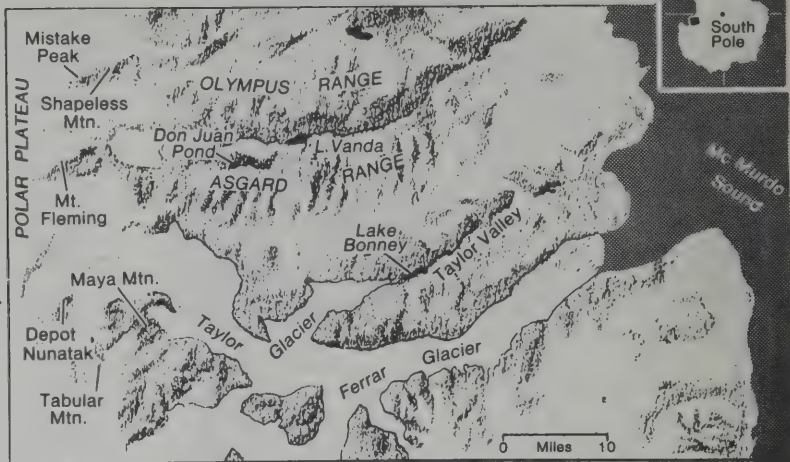
The last of the 31 early summer flights by Military Airlift Command Starlifter jets has been completed. Since October 7 the Starlifters have flown south 1000 people and 1,104,459lb of cargo.

The Royal New Zealand Air Force's wheeled Hercules helped deplete the cargo yard still further with its delivery of 141,897lb of cargo and 76 passengers on seven flights.

In addition the United States Navy's ski-equipped Hercules has taken 51 passengers and 102,273lb of cargo to the Antarctic to date. Dec. 16

Copters Hunt for Uranium in Flights in Antarctica

Below, an aerial view of Dry Glacier Valley in Victoria Land—beyond which are the mountains whose topmost sandstone layers are the focus of uranium prospectors.



By **WALTER SULLIVAN**
The New York Times

IN FLIGHT OVER VICTORIA LAND, Antarctica—Lieut. Comdr. Mike Brinck files his helicopter directly at the towering rock wall of Tabular Mountain. Then, just as a crash seems inevitable, he banks and turns to parallel the wall 100 feet from its craggy sandstone face.

Dr. Franz Tessensohn of West Germany's geological survey, hunched between pilot and co-pilot so he can look ahead, calls to Kent Crisler, student at the University of Kansas, that a run has begun.

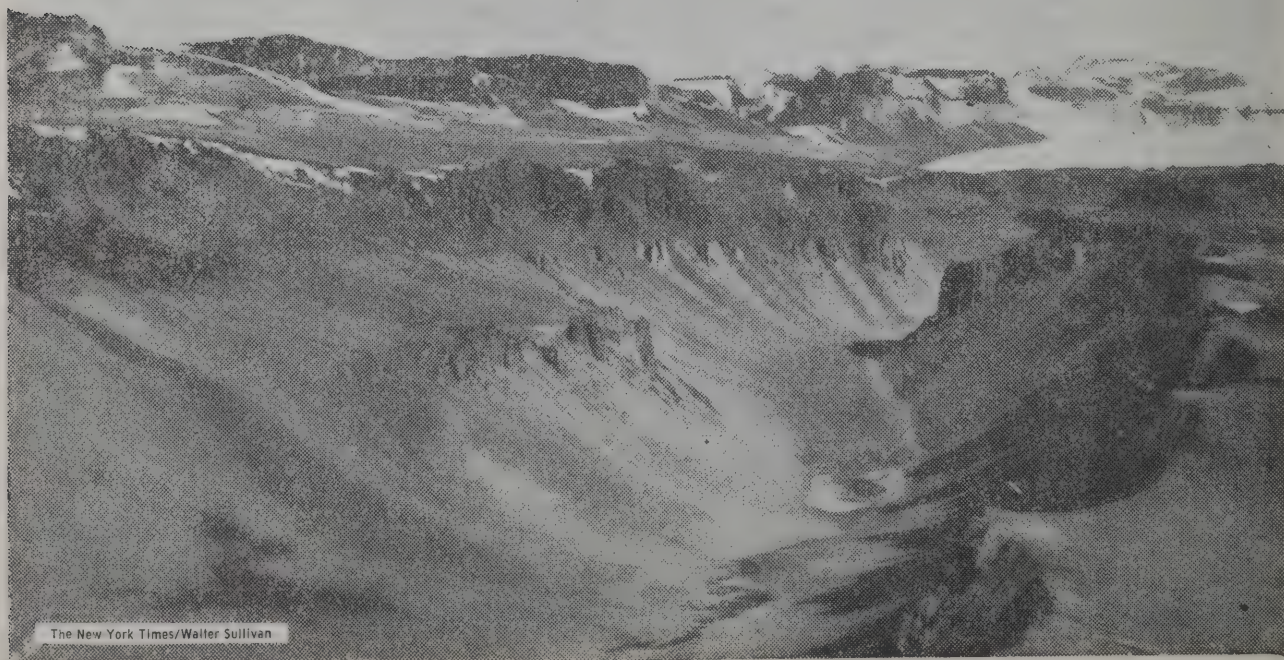
A steady stream of chart paper flows from the gamma ray detector between Mr. Crisler's knees—a big metal cylinder—and he scribbles on the paper margin alongside the continuous wiggles and peaks inscribed in red by a nervous pen. He must keep track of where each observation is made.

The search is for uranium—not as a step toward exploitation, but to help those nations—including the United States—now trying to formulate a policy for ultimate disposition of the resources hidden within this vast continent.

Ranges Buried in Ice

The targets are the topmost sandstone layers of the higher mountains of this region. The ranges surveyed—Shapeless Mountain, Mistake Peak and the like—are 9,000 to 10,000 feet high. In most cases all but the uppermost few thousand feet are buried in the ice flowing off the South Polar Plateau toward the sea.

The ranges are part of the Trans-Antarctic Mountains that span the continent from its Pacific to its Atlantic shores, forming one of the world's major mountain systems. The higher ones are often capped with flat-lying layers of Beacon sandstone, a formation made famous early in this century by the accounts of Robert Falcon





Scott and Sir Ernest Shackleton.

When the continents figuratively are fitted back together, as they seem to have been 200 million years ago, the formations here appears related to those of similar age and structure that produce uranium in the Karroo area of South Africa and in India.

According to Dr. Edward J. Zeller of the University of Kansas, in charge of the uranium hunt here, part of the Karroo formation contains 2 percent uranium. The search is being conducted with helicopters flying out of the American base at McMurdo Sound.

The most encouraging find so far has been a recording made a few days ago with Dr. Gisela Dreschhoff at the detector. She is a German-born associate of Dr. Zeller and like him a radiation physicist. The needle swept off scale as the helicopter flew along the flank of Maya Mountain that forms the west wall of Beacon Valley.

Radiation Above Normal

For about a mile and a half the radiation was three times normal. The area is near the head of Taylor Glacier, which flows into a valley whose lower part is free of ice.

The observation must now be followed up on the ground and specimens collected. "It may turn out to be nothing," according to Dr. Zeller, but the "hot area" is clearly defined and not associated with any change in surface topography, implying that the radiation represents a localized deposit.

While the readings did not indicate a very rich resource, the searchers believe it may show that uranium concentrations exist in the Beacon sandstone—some of them perhaps of economic importance.

The cliff-hugging flight strategy is necessary because the horizontal surfaces here are almost all buried in ice and snow, which mask the gamma rays generated by uranium and other radioactive elements.

Listening to chatter between the pilot and co-pilot on the intercom headset is less than reassuring when one hears comments like: "I'm not sure the aircraft can make it up this one, but we'll give it a try."

The air is so thin at this elevation that

the climbing rate and general performance of the helicopter are impaired.

We fly at from 40 to 60 miles an hour a few dozen feet above a long ridge—in this case bare of snow and ice—with Mr. Crisler making notes and never looking out. A veteran of helicopter operations in Vietnam, he seems unperturbed.

Suddenly the ground drops from beneath us and we are thousands of feet above a deep canyon. The sensation is somewhat like jumping off a very high cliff.

The relief of the region, in terms of canyons, cliffs and lofty mountains, is dramatic. Clouds have kept us away from part of Shapeless Mountain—our first goal—and seem to be closing off possible return routes down valleys leading to McMurdo Sound.

'Ground Truth' Found

We descend to a bare, level area near the summit of Mount Fleming and hover while Larry Lister, chief aviation machinists mate, opens the right door, leans out and peers down as prop wash blows into the cabin. With his headset he can talk to the pilots above the engine roar.

"Looks pretty good, sir," he says. "A bit forward . . . more to the left."

With the craft only a few feet off the rocky ground he jumps out with the long wire that links him to the pilots in one hand, then coaches the last few inches

of descent. Landings on this mountain have provided the "ground truth" needed to verify validity of the airborne record.

The airborne instrument contains a sodium iodine crystal 112 cubic inches in volume. When a gamma ray penetrates such a crystal it produces a flash of light that, in turn, is detected by a light monitor (photomultiplier).

The rays originate in thorium and a radioactive form of potassium, as well as in uranium. Next year Dr. Zeller hopes to have a detector that records on four channels—one each for gamma ray energies typical of uranium, potassium and thorium, plus one sensitive to all three.

In some Government prospecting, according to Dr. Zeller, huge crystals of 6,000 cubic inches are used, but that is over flatter country where fixed wing aircraft with more load-lifting capacity can be used. Here on the heights of Mount Fleming, Mr. Crisler carries a portable

detector with a four-cubic-inch crystal over the terrain. While it is less efficient than the airborne one, it can be held close to the rock.

Boulders Slaped by Wind

We are lucky, for while the temperature is chilly at about 16 degrees Fahrenheit there is no wind, even though weirdly eroded boulders testify to the force of blasts that often sweep the area. The flight crew opens cans of fruit juice and cookie packages.

Then we lift off to scout Depot Nunatak, Horseshoe Mountain and other summits. "Nunatak" is an Eskimo term for a mountain buried in ice except for its summit and this one looks as though it were poking up through a cloud deck instead of very solid ice.

While most of Antarctica is buried in ice, the Beacon sandstones have been lifted high enough to be exposed along much of the Trans-Antarctic Mountains. The present flight can only reach those near McMurdo Sound but Dr. Zeller hopes the search can later move south near the Beardmore Glacier where the formations are thickest.

Uranium becomes concentrated in such formations, he says, after that metal has been extracted from suitable basement rock by water action and the uranium has then come in contact with organic matter. Once it combines with such matter it no longer remains dissolved in the water but forms a deposit.

The presence of coal and fossil trees shows that ample organic material was once available here.

Elsewhere in the world a number of rich deposits appear to have formed in the manner described by Dr. Zeller. Those between Grants and Albuquerque, N.M., appear to be in old streambeds as are the ones in Gabon, West Africa, that have supplied the French nuclear weapons program.

At Oklo, in Gabon, the deposit was so rich that long ago, when the percentage of uranium 235 (the fuel of nuclear reactions) relative to uranium 238 was greater than now, spontaneous chain reactions occurred. Some physicists believe comparable deposits may exist elsewhere—including Antarctica.

The surveying here is being done by Navy aircraft under contract with the National Science Foundation.

2-Ton Whale Is Flying To Show in California

LONDON, Oct. 17 (Reuters)—A chartered jet left Heathrow airport for the United States today carrying just one passenger — a 5-ton whale named Ramu.

The 20-foot mammal, which had been performing at Windsor Safari Park near here, was being shipped to the Sea World Marine Park at San Diego, Calif., because he outgrew his English pool. Ramu, squawking in protest, was lifted aboard the jet in a corset with holes cut out for his fins; he was ferried to the airport by crane and truck.

Before he boarded the trans-Atlantic flight Ramu was given a rubdown with five gallons of oil to prevent his skin from drying. The flight crew was told to hose him down frequently. Ramu's air ticket cost \$50,000.

Drifting Arctic Station Planned To Study Ice Ages and Climate

By WALTER SULLIVAN

Plans are in preparation to allow an aging Coast Guard icebreaker to become frozen into the Arctic ice pack north of Siberia and be carried by drift past the North Pole toward the Atlantic Ocean.

To be known as the Nansen Drift Station, it would carry a wide range of specialists during its two to three years of imprisonment.

They would seek clues to past ice ages and ways to predict future climate changes. They would conduct observations as high energy particles from the sun bombard the polar sky during the next sunspot maximum in 1978, causing radio blackouts and auroral displays.

The project would re-enact the epic drift of the Norwegian ship *Fram* from 1893 to 1896, led by Fridtjof Nansen. The icebreaker, of the "Wind" class, would, however, be far more elaborately equipped with laboratories and devices for observations aloft and beneath the sea.

The Polar Research Board of the National Academy of Sciences has invited research

proposals from American and foreign scientists. Next month the National Science Board will review the resulting prospectus and the outcome will probably determine whether the National Science Foundation will support the project.

It is hoped that the Office of Naval Research will also provide support, financial or otherwise.

The original plan was to freeze the icebreaker *Burton* Island into ice north of the Laptev Sea in the fall of next year. The ship, launched in 1946, was due to be laid up this year. However it may have to substitute for the *Polar Star*, which recently suffered damage to its screws, delaying the project one year.

The *Polar Star* and *Polar Sea*, launched a year ago, represent the new generation of icebreakers, larger than any built to date outside the Soviet Union.

The proposed crossing of the Arctic Basin by a frozen-in icebreaker would continue and amplify a broad program of Arctic research whose most recent chapter was called AIDJEX (the Arctic Ice Dynamics Joint Experiment).

The latter, after five years of planning, involved 14 months of intense observation ending in May. Its goal was to determine the factors that cause ice movement and internal pressure. These include wind, ocean current, roughness of ice floe bottoms, influence of nearby coasts and stresses within the ice itself.

The goal is to produce predictions useful to ships seeking to reach oilfields on Alaska's north coast. In April, for example, a nuclear submarine made the ice bottom observations. A year earlier four camps were set up on ice floes within the study area, surrounded by a ring of nine automated buoys 250 miles in radius.

Destruction By Bears

Data radioed by the buoys was picked up and relayed by the Nimbus 6 weather satellite. Polar bears mauled equipment and last Oct. 1 the floe carrying Big Bear, the main camp, split, leaving the mess hall suspended over a canal 15 feet wide. After further cracking the camp was abandoned and Caribou, a satellite station, became the main base.

Then, in February an open-water lead 300 feet wide separated Caribou from its snow runway. It closed again and the two other stations,

Snow Bird and Blue Fox, remained intact. From changes in the relative positions of the stations it was possible to assess variations in stress within the pack ice.

Positions to within a few dozen feet were determined with the Navy Navigation Satellite System—a method that presumably will be used by the Nansen Station. The Science Foundation and Navy provided some \$2 million for the project during the 1975 fiscal year.

If the icebreaker drift begins in 1977 it will contribute to the first worldwide experiment of GARP (the Global Atmospheric Research Program). The latter includes Soviet and American POLEX (Polar Experiment) projects seeking factors responsible for climate changes and ice ages.

The icebreaker would carry two helicopters plus a small fixed-wing plane on skis. It should cross the region where it is believed the floor of the Arctic Ocean is being pulled apart. Of the global network of such "spreading centers," related to continental drift, this is the only one inaccessible to ordinary ships.

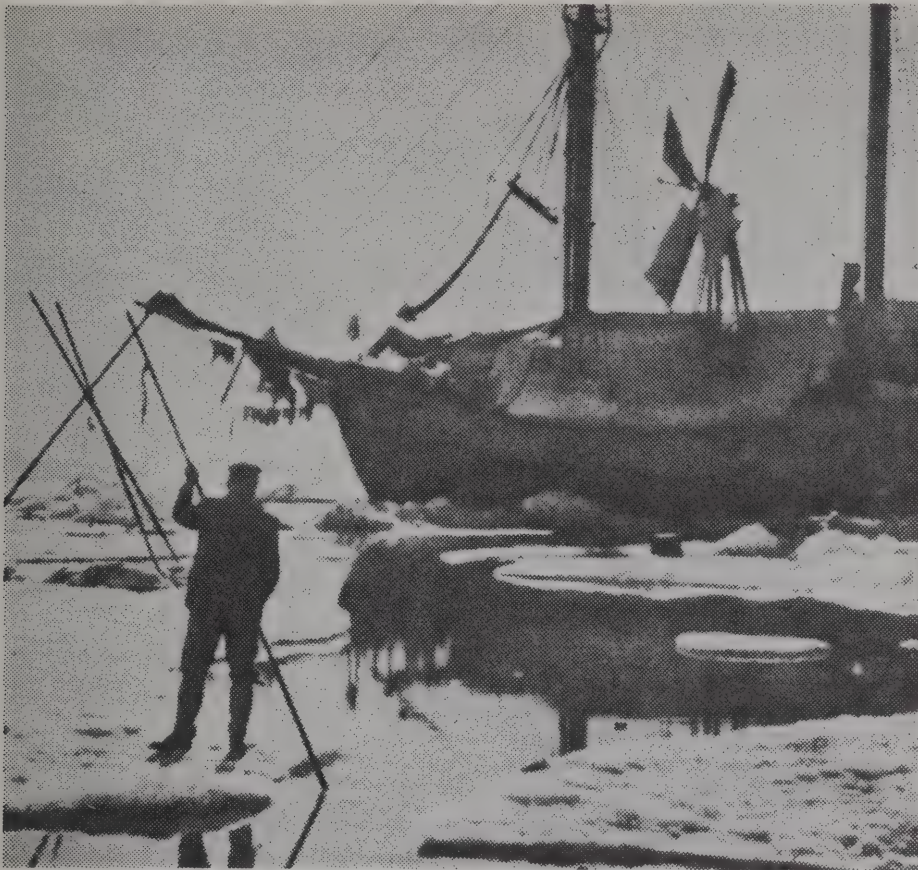
Because sediment accumulates slowly on the floor of that ocean, a piston corer, driven deep into the bottom, should extract enough sediment layers to retrace the history of that ocean far into the past. The timetable of its temperature fluctuations and variations in ice cover should help explain the ice ages.

Nansen, in planning his expedition, knew that wreck-



Proposal is to allow an old Wind class icebreaker, such as this, to retrace *Fram* drift across North Pole region.





The Fram imprisoned in ice on drift across Arctic Ocean in 1890's. Windmill saved fuel.

age of the Jeanette, trapped north of the Chukchi Sea (northwest of Alaska), had been found on the coast of Greenland. So had trees from Siberian forests. He therefore assumed that, if his ship was frozen in on that side of the Arctic Ocean it would be carried within walking distance of the North Pole.

The Fram did come within 268 miles of the Pole. Nansen and a companion had left the ship and were unsuccessfully striving for that goal on foot. They eventually reached Spitsbergen and the ship broke out of the ice on the Atlantic side.

Since 1918, drifting stations have periodically been set up on floes, providing much of what is now known of the Arctic Basin. The Russians in the 1930's set up a camp at the North Pole (it moved steadily toward Greenland) and a number of American stations have been manned, either on floes or ice islands.

The latter are relatively rare, flat-topped icebergs formed when thick fragments of coastal ice have broken loose. The most famous, T-3 or Fletcher's Ice Island, has been caught in the great

Arctic Ocean Gyre since its discovery in 1947 and its occupation five years later by a party under Col. Joseph O. Fletcher.

The Gyre is a circular pattern of drift that dominates the region between the North Pole, Alaska and the Canadian Archipelago. T-3, apart from periods when it was aground, has made several circuits of that region in the last 30 years.

The chairman of the planning committee is Dr. Norbert Untersteiner, professor of atmospheric sciences at the University of Washington in Seattle. In a recent interview he said that, while the ship was far from land, its supplies and personnel would be replenished by Hercules aircraft.

Such planes, with a ski-wheel combination landing gear, can alight on large, smooth ice floes. Closer to shore this could be done by smaller planes. Since the drift path will probably lie on the Soviet side of the Arctic Basin a Soviet scientist would be particularly welcome, Dr. Untersteiner added.

Aircraft To Measure Ice Thickness

Anchorage Times

This summer's sealift to the North Slope made it through the Arctic Ocean ice without the help of a specially - equipped aircraft which the federal government had planned to use to measure the thickness of the ice.

The aircraft is coming anyway, Cmdr. Philip Benediktsson, head of the Military Sealift Command for Alaska, said yesterday.

The National Aeronautics and Space Administration will use the plane to try to locate an ice island, he said. If it works, he added, the radar could be a "real help of someone is hung up out there or to find an island left empty from a previous year's experiment."

The Navy's Arctic Research

Laboratory at Point Barrow has for several winters conducted various scientific tests of Arctic ice floes by establishing temporary camps on large floating islands.

The special Hercules C130 will be equipped with side-looking radar. As it flies over the ice, the radar will send its messages to a computer aboard the aircraft, which will relay the information via satellite to Nasa's laboratory in Cleveland, Ohio.

The center will analyze the information and send its results back to Barrow via another satellite "all in the space of 20 minutes," Benediktsson said.

If this summer's barge shipments to North Slope sites had encountered the severe ice conditions of last year, Benediktsson said, the plane could have helped thread a path through the ice.

The method was used last year in the Great Lakes and enabled shipping to continue through the winter for the first time, he said.

Three Coast Guard cutters also were prepared to aid the barges in reaching their destination. Contingency plans called for cutters at Kodiak and Homer to head for Barrow if needed.

And the Coast Guard's icebreaker, the Burton Island, already is in the Icy Cape and Barrow area, conducting bottom surveys and aids to navigation.

Also in the area is the cutter Glacier from Long Beach, Calif., studying surface ocean currents in the area from Barrow to Barter.

The oceanographic work is for the Bureau of Land Management and the National Oceanic and Atmospheric Administration, in conjunction with proposed federal offshore lease sales. Aug. 18

Indian-Eskimo Aid Bill Gains

WASHINGTON, July 30 (UPI) —The House of Representatives passed today a bill that would authorize a three-year, \$466.4 million program for health care for American Indian and Eskimos to bring their health care up to the standards of the rest of the country. The program would begin Oct. 1, 1977. The bill was sent to the Senate, which passed a similar bill a year ago. The House delay was caused in part by a requirement that three committees act on the bill because of jurisdiction overlaps.

Last Alaska Oil Pipe Laid In Race Against Winter

Anchorage Times

Dec. 7

Working in six feet of snow on terrain "so steep a man can't stand up straight without tying on to a winch," workers have finished laying pipe for the \$8 billion trans-Alaska pipeline.

"It feels great. It was really nip-and-tuck whether we would get the pipe in" on 2,800-foot high Thompson Pass, said Lou Cancelmi, Alyeska Pipeline Service Co. spokesman.

He said the pass route plunges down from about 2,800 feet to 1,000 feet in less than a mile, resulting in grades of up to 47 degrees. A sort of ski lift was used to get work material to the site in time to finish the work over the weekend, hours before a major snowstorm hit South-central Alaska.

Much work remains to be done on the biggest private construction job ever. There isn't one continuous length of pipe 800 miles long; some sections remain to be welded together.

And that will have to wait until spring when 160 miles of the pipe will be pressure tested. The work schedule also includes rewelding of less than 40 potentially defective welds.

Former Gen. Andrew Rollins, who heads the Interior Department's Alaska Pipeline Office, said: "That oil's going to flow on that line next summer, barring some unknown catastrophe. It's not a bad job. It could have been better but it's not really too bad a job."

Chuck Champion, state pipeline coordinator, says: "It's beautiful. They've hardly knocked down a tree that they didn't have to."

Workers began laying pipe in March 1975. Construction on the pipeline haul road started a year earlier, with more than 20,000 workers employed during peak construction. The final pipe installation site was 20 miles northeast of the pipeline port of Valdez in the southernmost section of the line.

The project began moving in 1969 when the low temperature steel pipe was ordered from Japan. Much of it was delivered before environmentalists successfully stopped work on the project with court suits.

When the project was conceived it was estimated to cost less than \$1 billion. The current cost estimate is about \$8 billion with some estimating the final cost at \$10 billion. At least three government agencies are investigating cost overruns to see whether Alyeska should be penalized. This information will help determine how much Alyeska is allowed to charge the oil companies for using the pipeline.



About half the line is buried and the rest is above ground on 78,000 vertical supports designed to absorb energy generated by earthquakes.

After the first few days of operation the flow will total 1.2 million barrels of oil daily — increasing to two million barrels a day when owner companies give the go-ahead to construct additional pump stations. The two million barrels a day capacity will require oil from other North Slope fields in addition to the Prudhoe Bay field.

But before the oil flows, two to four weeks will be spent getting the line in shape for oil. Alyeska expects to start by pumping 300,000 barrels daily by July 1 with oil taking 4.5 days to travel the 800 miles from Prudhoe Bay. This slower rate will be used to allow the 140-degree oil to cool a bit and also to allow the line to settle into place.

The companies building the line are Sohio Pipeline Co., BP Pipelines Inc., Arco Pipe Line Co., Exxon Pipeline Co., Mobil Alaska Pipeline Co., Union Alaska Pipeline Co., Phillips Petroleum Co. and Amerada Hess Corp.

Arctic science connected to Native unity

News-Miner, Fairbanks

Aug. 5

The connection of Arctic science to the developing circumpolar community of Native peoples was discussed in a paper by Eben Hopson, Mayor of the North Slope Borough. Hopson was not present but his remarks were read by George Ahmagok of Barrow.

Hopson called on the Arctic scientists to participate in the regional nation now being planned by him and others, which would join together the Inuit (Eskimor) people of Siberia, Canada, Alaska and Greenland. People in these areas have common economic interests and other similarities, he said.

"Arctic science is problem-oriented and the problems are regional," he said. If Arctic scientists participate in the new development, they can help work out a regional policy and "maintain the confidence of the rest of the world that the Arctic will be preserved," he said.

At present, Arctic science seems unconnected to the Inuit language and does not serve his community's needs, Hopson said.

"Year after year we hear of scientists discovering things which were common knowledge to us," he said. Arctic science really doesn't produce new material, it merely "reorganizes it for international interests," he said.

Pipeline not affecting aquatic life

MOSCOW, Idaho (AP) — Sections of the trans-Alaska "oil pipeline" which cross streams are producing little environmental change, a University of Idaho entomologist says.

Dr. Merlyn Brusven said aquatic insect life samples were collected above and below the pipeline crossings to determine the effects of excavation and pipe installation.

"Evidence suggests little physical change in the stream environment below pipeline crossings," he said. "Aquatic insect life has not changed appreciably above or below the crossings."

It is difficult to measure if there were changes at some points because few studies were made on the undisturbed environment prior to placement of the pipeline across streams, said Brusven, a member of an Arctic Research Laboratory team.

Brusven said he was invited to join in the study because there is no aquatic entomologist at the University of Alaska.

The pipeline is buried 12 to 16 feet below the surface of streambeds when it crosses smaller streams and rivers, Brusven said.

Nov. 13

Fossils Indicate Land Bridge

Sept. 23
WASHINGTON (AP) — Scientists say they have found the first fossil evidence indicating that a land bridge once spanned the northern Atlantic Ocean between North America and Europe.

Fossils of mammals, birds and other animals found this summer on Canada's Ellesmere Island, located above the Arctic Circle west of Greenland, match similar remains found in Europe and the western United States, they said.

Dr. Robert M. West of the Milwaukee Public Museum in Wisconsin and Dr. Mary R. Dawson of the Carnegie Museum of Natural History in Pittsburgh announced the findings Wednesday at a scientific meeting in Montpellier, France.

The scientists said fossil similarities of the two continents traditionally have been explained as evidence that animals came to North America via Asia and a land bridge across the Bering Sea near Alaska.

More recent geological evidence leads some scientists to believe that the North American and European continents once were joined but gradually split apart, with the Atlantic forming between them.

Drs. West and Dawson said their findings go a long way to prove that theory is correct.

The last continental connection probably stretched between the

Eskimos Seek to Alter Written Language

By ROBERT TRUMBULL

The New York Times

OTTAWA, Sept. 5—Canadian Eskimo leaders will ask the Government here this week to accept a simplified writing system to improve communications and education among the 20,000 native peoples of the Far North.

The new method, substituting two simplified forms for the five now used in different Arctic regions, was devised by a committee of Eskimo linguists who began work two years ago. It combines, in both Roman letters and phonetic symbols, features of the separate systems developed in the past by Anglican and Roman Catholic missionaries in the North.

Prior to the missionary programs, undertaken separately by the churches, the Eskimos were without a written language and passed down their traditions and legends orally. The language, which Eskimos

call Inuktitut, is spoken from Greenland to the Bering Strait with minor dialect differences.

However, the use until now of separate systems of writing in different areas has hampered communications among the Eskimos in widely scattered and isolated settlements, said Joseph Kusugak, the chairman of the Eskimo Language Commission, which drew up the standardized method of writing.

Uses Roman Alphabet

The new system applies the Roman alphabet to the Eskimo language in a standardized spelling with Roman letters. It also standardizes the use of simple symbols to represent syllables in the language, the way sounds are conveyed by shorthand symbols.

The new form was approved at a conference in Frobisher Bay, in the Northwest Territories. The conference included delegates representing all the Northern settlements, plus Government officials, missionaries and teachers.

The Eskimo Brotherhood, an Ottawa-based organization, will now ask the Department of Indian and Northern Affairs, the Federal agency in charge of relations with native peoples, to make the use of the alphabet and syllabary official policy in Eskimo education and communication.

Mr. Kusugak said Eskimo linguists touring the Northern communities found that neither the Roman letters nor the phonetic symbols could be adopted alone without strong opposition from Eskimos who are devoted to one method or the other, so it was decided to retain both systems in two forms that can be used interchangeably.

The executive director of the Inuit Cultural Institute, Tagak Curley, said improved communications through a standard writing system will enhance leadership qualities and create greater unity among the Northern people. "Inuit" is the term that Eskimos apply to themselves; it means "the people."

Biologists Study Birds Of Arctic

Anchorage Times

BARROW — Arctic coastal habitats of birds are being mapped by 14 field biologists from the state Department of Fish and Game who at the same time are conducting bird censuses.

The program, being conducted from the Naval Arctic Research Laboratory here, is expected to continue into early fall.

Led by George Divoky, the biologists actually are working on three interrelated projects dealing with bird numbers, habitat locations and bird-ice relationships.

The projects are funded by the Outer Continental Shelf Energy Program in an attempt to find out what areas from Cape Lisburne to the Canadian border have the most bird usage. The study is to determine the potential dangers of oil drilling to wildlife.

For the mapping project, two persons are traveling along the North Slope. They will try to visit each place two

or three times during the summer.

To check bird use of the Barrier islands, a crew is traveling by boat from Point Lay to Barrow. Bird censusing also will be conducted from a helicopter at Prudhoe Bay while an inflatable boat will be used along the Beaufort Sea coast from Plover Island to Prudhoe.

The study of birds and sea ice is being conducted from a U.S. Coast Guard icebreaker.

According to Divoky, 185 species of birds have been found on the North Slope with 151 of them sighted in the Barrow region.

July 22

Satellites to aid phone service

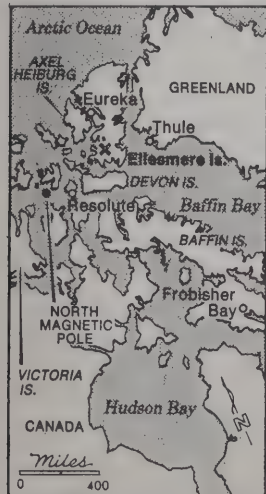
By the Associated Press

Ottawa

Long distance telephone users in the Canadian Arctic will be served by satellite by the end of the year.

The federal communications department says an earth station to provide a link with the satellite will be established, with the government and the telephone company sharing the costs.

The satellite service will replace the less reliable telephone service now in use.



Ellesmere Island: its fossils point to continental link.

northernmost tips of the continents by way of Greenland, Iceland and Spitsbergen, an island north of Scandinavia, they said. This probably split apart 45 million to 48 million years ago.

The fossils found along barren, rocky Ellesmere Island also show the climate was different. At the time these animals lived, this area just 500 miles south of the North Pole apparently was somewhat swampy with a temperate climate, the scientists said.

Plant fossils also showed that temperate trees such as the sequoia grew in the area.

U.S. to Give Alaska Natives 4 Million Acres in the State

WASHINGTON, Aug. 7 (AP)

—An agreement to turn over four million acres of land to Alaska natives has been signed by Secretary of Interior Thomas S. Kleppe.

It was the first major land conveyance under the 1971 Alaska Native Claims Settlement Act, which provided for a cash settlement of \$962.5 million and selection by the natives of 40 million federally owned acres, about one-eighth of the state.

The agreement was signed yesterday by Mr. Kleppe and representatives of the Arctic Slope Regional Corporation, one of the 12 regional corporations established by the Settlement Act.

U.S. Team Plans Search in Alaska For Early People

By **BOYCE RENSBERGER**

The New York Times

WASHINGTON, Sept. 28—One of the biggest archeological projects ever mounted in the United States is to be conducted over the next three years in Alaska to search for remains of the first people to enter North America from Asia over the now submerged Bering land bridge.

The projects, announced here today, is to cost \$600,000, with half of that to come from the National Geographic Society and half from the National Park Service.

A financial commitment of this size is highly unusual in New World archeology and is indicative of the recently growing scientific interest in the question of when man first reached the Americas.

The project is expected to concentrate in and around an archeological dig known as Dry Creek, 75 miles south of Fairbanks. The site, just north of Mount McKinley National Park, was discovered in 1973 by Charles Holmes, then a graduate student and now with the Alaska state park system.

The new project will be directed by two scientists at the University of Alaska—Dr. William R. Powers, an anthropologist, and Dr. Russell D. Guthrie, a zoologist.

Their earlier excavations at Dry Creek have produced a number of relics of human presence about 11,000 years ago. Although no human bones have been found, there are a fair number of flaked stone tools and refuse heaps of bones of animals believed to have been killed and eaten by the people, who subsisted by hunting.

Most anthropologists believe man entered the New World long before this date. The Alaska scientists hope that further digging at Dry Creek or in the surrounding area will turn up earlier traces of man. Much of the money will go for extensive surveys of a 4,800 square mile area surrounding Dry Creek.

Some Scientists Skeptical

Older evidence of man has already been found at a site known as Old Crow in Canada's Yukon. Dr. William Irving, of the University of Toronto, who has led the Old Crow dig and who is an adviser to the Dry Creek project, has found numerous examples of stone and bone tools that are believed to be between 20,000 and 30,000 years old.

Still older dates have been suggested for human bones and stone tools found in Southern California and in South America. The dating of these materials is not fully accepted by all anthropologists but some have said they point to man's arrival in North America some 70,000 years ago.

The migrations from Asia could have occurred only during the peaks of the Ice Ages when so much water was locked into the thick ice sheets that sea levels were low enough to expose what is now sea bottom. This is known to have happened 12,000 years ago, 40,000 years ago

University awarded contract by Navy

News-Miner, Fairbanks

Nov. 3

Now operating under the first competitively bid contract in its more-than-20-year history, the Naval Arctic Research Lab at Barrow faces an optimistic future, according to the head of the lab.

Director Warren Denner, in a newspaper interview a year ago, said he was troubled about the lab's future as it continued to meet increased demands without an increase in funding.

"My feelings are very much more optimistic today than they were then," Denner told the News-Miner recently. "Government agencies that a few years ago were not paying much attention to the Arctic are now drafting plans for further study."

And Denner said he believes the competitive bid process for lab operations is the best process considering the size of the contract.

The Navy Department sought bids for two phases of laboratory operations for the first time this year. Both contracts were awarded to the University of Alaska, which has operated the laboratory for the Navy since 1954.

This year's contract names the university as prime contractor, with a total contract value \$6,367,170. The university will subcontract the operations and maintenance portion of the contract to ITT Arctic Services, the former contract holder, for \$4,566,435, leaving scientific and administrative functions with the university at a price of \$1,790,735.

Denner said he believes that under the new contract, "the university is in a very positive position for supporting scientific programs in the Arctic."

The lab can provide housing and facilities for about 100 scientists,

Denner said, claiming he is com-

fortable with that level of support.

Denner also is encouraged by the acquisition earlier this year of two new aircraft to provide air support for field research. The two DC3's operated by the lab were returned to the Navy Department in exchange for two "Super DC3's," a more modern version of the aircraft.

This summer the lab also acquired an 85-foot aluminum vessel. A "light warping tug," it originally was designed for sidelading on a landing craft, but is well suited for arctic marine work. The 67-ton craft requires only two feet of water for operation and will be used for research in the Beaufort Sea.

Denner said a year ago that scientific study in the Arctic will become increasingly important with exploration and development continuing in Arctic regions. Today, he still holds that feeling, but is far more confident that the Naval Arctic Research Lab will continue to play a significant role in aiding that scientific study.

Major fire at Prudhoe

News-Miner, Fairbanks

Fire destroyed an airplane hangar, five helicopters and a light plane at Prudhoe Bay's Deadhorse Airport early Friday, causing a loss estimated at \$2,000,000.

Alaska State Troopers report the hangar was owned by Sea Airmotive Inc. The fire was discovered by an employee, Jim Quackenbush, at about 2:30 a.m.

Firefighters from the Division of Aviation, BP Alaska, and Atlantic Richfield Co. responded, but were not able to control the blaze.

Troopers said attempts to remove the aircraft from the building failed when the electricity went off and the hangar door could not be opened.

Aircraft stored in the hangar included four Jet Ranger helicopters, one Bell 205 helicopter and a Cessna 206 plane. The aircraft belonged to Sea Airmotive, an Anchorage-based firm.

Troopers said the fire may have started in a generator in the building, but the cause is still under investigation.

Quackenbush, was the only person in the building at the time of the fire and he received minor burns.

Nov. 27

and 70,000 years ago, and at still earlier times.

At its maximums, the Bering land bridge was 1,500 miles wide and supported a cold and dry plains or steppe environment favored by mammoths, musk oxen, caribou and other large animals.

The significance of the Dry Creek site is that it lies in a narrow corridor that remained ice-free during the glaciations. The area, on the north slope of the Alaska Range of mountains, would have been a natural migratory route for animals and, presumably, for the hunters following them. Whatever traces the hunters left behind would not have been disturbed by subsequent glaciers.

On a Sea of Ice

Out in the middle of the Chukchi Sea, within the Arctic Circle where the summer sun shines 24 hours a day, the ice rules. Cold and awesomely quiet, it presents an endless off-white horizon of frozen brine, a barrier to all but the stoutest of vessels: the icebreaker.

For the last 30 years, the U.S. Coast Guard polar icebreaker *Burton Island* has plied these waters north of Alaska, escorting cargo and research ships through the dangerous floes. The arctic summer is the only time the ice is the least bit yielding. During the past two months, dozens of barges and cargo ships, loaded with everything from prefabricated houses to peanut butter, have

directly into the ice, crushing it with her own weight, pushing the frozen debris down under and shoving larger pieces astern.

But it is not all routine. "There are no rules out here," says the *Burton Island*'s 44-year-old captain, James Fournier. "One minute it can be clear and the next it can be a 'white-out' with blinding fog or snow . . . You not only have to know exactly where you're going but where you've been."

The ship is heavily insulated from the cold but not from loneliness. The average age of the 220-man crew is only 21, and for psychological reasons the maximum length of duty is 27 months. For most of the crew—few volunteer for icebreaker duty—the rotation isn't fast enough. There's no TV and only one commercial radio station. Most of the movies shown on board are three years old and most of the crew members have seen each of them at least twice. So the men entertain themselves with books, cassette tape players and card games. Discipline is a lingering problem, but despite the gloomy environment, there are surprisingly few fights. "After all," says one seaman, "if you make enemies here, there aren't that many places for you to hide."

Long Separation: For married men, the isolation is even more intense and the divorce rate is high; on this trip alone four have received notices. "I last saw my wife June 20," says Chief Quartermaster Anthony Worsham, 29, "and it will be October before I see her again." In the last two years the Worshams have been together only eight months.

The ship carries enough provisions to cruise 38,000 miles without refueling: up to 150 tons of food, 30 tons of spare parts, 690,000 gallons of fuel oil and a desalination plant capable of providing up to 10,000 gallons of fresh water daily. The cost: more than \$266 million yearly.

Despite a new paint job and extensive refitting, the *Burton Island*'s distinctive red hull shows scars of the time her bow was crumpled by huge ice packs and her stern was dented by runaway tows. A few weeks ago, she hit some ice that bent ten steel braces near the bow and broke a weld. During my brief stay, only four of the six ancient engines were working.

This trip marks the end of the ice-breaking line for the *Burton Island*. When the tour ends in October, the ship will be decommissioned and converted into a polar research vessel. The crew will be glad to leave, but most agree that their experience has been worth it. "I might bitch and scream all day," says 31-year-old Christopher Kiefer, the ship's engineering officer, "but at night I'll go out on the fo'c'sle and just watch the brute force of the ship breaking that ice. It's beautiful and breathtaking and I guess it always will be."

—PETER S. GREENBERG

Education in the Polar North

The Eskimos and Indians of the northern polar region have had little voice in the operation of their schools. A few efforts have been made to include native representatives in discussions on native education, notably a major conference held in Montreal in 1969. As a result, officials from countries in which the northern peoples live—the United States, the Soviet Union, Canada, Finland, Greenland, Norway, Sweden, and Denmark—have become more aware of the needs and abilities of people in the polar North, and some policies have begun to change. But rule by imposition is still the prevailing pattern.

Over the next two years four or five seminars will be held in the most concerted effort yet made to enable native leaders from the north to share their views on education and related issues with officials and scholars. The first meeting, held in Alaska in October, discussed land use and acquisition as well as education. Attending were native leaders, officials, students, and scholars from seven countries.* Later meetings will be held in Canada, Greenland, and Norway.

The seminars are being arranged by the **Scott Polar Research Institute of Cambridge University**, England, which has been granted \$40,000 by the Foundation, primarily for travel and living expenses of native leaders. One of the major stumbling blocks to earlier conferences has been the high cost of travel in the vast polar region.

Project Director:

Terrence Armstrong, Scott Polar Research Institute, Cambridge University, Cambridge, England.

Ford Foundation



Peter Greenberg—Newsweek

Burton Island: An icy loneliness

raced the weather to supply remote northern villages and feed the voracious appetites of the new Alaskan pipeline communities. By Oct. 1, the ice packs will close all Chukchi shipping lanes, even to an icebreaker.

Lurching Voyage: The *Burton Island*, a superannuated member of the Coast Guard's five-ship icebreaker fleet, is making her last swing on active duty. The stubby craft has the draft of a battleship and the power of a vessel twice her size, but her broad, round, keelless bottom—designed to prevent the ship's hull from being crushed by the massive ice forces—makes for most uncomfortable voyages. On the open sea, the ship rolls almost uncontrollably; on station, she smashes, lurches and screams in metallic protest against the ice packs.

With her strangely beveled bow, armored with 1½-inch-thick case-hardened steel, she plunges ahead at 10 knots, tossing chunks of loose ice aside. For the more stubborn stuff, she charges

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Alaska Mail Delivery Ends 7-Month Lapse

NOME, Alaska, Dec. 20 (AP)—The mail was delivered during the weekend to the remote Bering Strait island of Little Diomedes for the first time in seven months. And villagers sent return mail and balloons from the Nov. 2 election on planes back to Nome, 130 miles to the southeast.

Villagers last received mail when the Bureau of Indian Affairs ship *North Star III* made its final call of the year two months ago.

The mail is generally delivered more frequently, but a severe freeze is northwest Alaska has prevented air deliveries. In the summer, mail is delivered in walrus-skin boats, but choppy ice conditions prevent that form of delivery by fall.

Over the weekend, the Eskimos of Little Diomedes, two miles from the Soviet Union, cleared the sea ice runway to allow the light aircraft from Nome to land, bringing 900 pounds of mail in each load.

Discovery of Soviet 'Crater' Called a Sign That Earth Was Heavily Bombarded Even After Planet's Infancy

By WALTER SULLIVAN

The discovery of what appears to have been an ancient impact crater six miles deep and more than 400 miles wide has been cited as evidence that bombardment of the earth by very large objects did not end in the planet's infancy.

The suspected crater, now heavily eroded and filled in, is in northern Kazakhstan in the Soviet Union. Its dimensions would embrace all of the Northeastern United States from Boston to Baltimore.

It was described, based on Soviet studies, by Dr. Frank Dachille of Pennsylvania State University at the annual meeting of the Meteoritical Society, an international association that met last week at Lehigh University in Bethlehem, Pa.

425 Million Years Old

Dr. Dachille has used estimated time-tables of crater-producing impacts on the moon, plus the recent discovery and dating of several large crater remnants on earth, to estimate the relative frequencies of large and small impacts on this planet.

The huge Kazakhstan feature appears to have been formed about 425 million years ago when the earth had already been in existence for more than four billion years. Such impacts, he proposed, occur about once every 100 million years.

It is widely believed, for example, that there was a major impact in the southwest Pacific area some 700,000 years ago. This would account for the glassy fragments, known as tektites, that are found in the region from the Philippines as far south as Australia and, as microscopic components of sea floor sediment, almost as far west as Africa.

No big crater has been found in the region, apart from a hint of one beneath the Antarctic ice south of Australia. It was noted at the meeting by Dr. Billy P.

Glass of the University of Delaware that none of the glassy fragments have been found in sea floor deposits between Australia and that hypothetical crater, whereas they do occur in the Indian Ocean and Philippine Sea (although not at all sites).

Their apparent absence south of Australia did not necessarily rule out the Antarctic site he said, since the intervening sea floor has not been thoroughly sampled.

May Be More Recent

The Australian tektites have been a puzzle since Charles Darwin brought some home on his round-the-world voyage aboard the Beagle in the 1830's. At the Lehigh meeting Dr. Brian Mason, meteorite specialist at the Smithsonian Institution in Washington, noted that the geologic evidence in Australia seems to be incompatible with a 700,000-year age for this event, implying that it was far more recent.

The earlier date is, nevertheless, supported by a variety of other age-determining methods.

According to Dr. Dachille's timetable, about every one million years, on the average, the earth is struck by a meteorite large enough to leave a crater 30 miles wide. Impacts heavy enough to produce craters like that in Arizona, under a mile in diameter, should occur at an average of every 2,500 years, he said. Many, of course land in the sea and leave no obvious record.

The older craters have been identified thanks to the discovery that the explosive impacts in which they were formed left telltale transformations of the rock. These include tiny diamonds, greatly compressed forms of quartz (coesite and stishovite), shatter cones and minerals known as impactites.

The huge area in Kazakhstan, centered on salty Lake Tengiz, has been attributed to impact in part because of seemingly shock-altered quartz formations there. It

is now referred to as the Ishim Impact Structure.

Soviet scientists have suggested that, as in the Sudbury Basin of Ontario, source of much of the world's nickel, the impact ruptured the earth's crust deep enough to release volcanic outpourings and generate ore deposits.

Another large Soviet crater remnant cited by Dr. Dachille is the Popigay structure close to the Laptev Sea in northern Siberia. It is 45 miles wide and is thought to have been formed 10 or 20 million years ago. The largest such feature of more recent age, is in the Anadyr Mountains of eastern Siberia.

Dr. Robert S. Dietz, of the National Oceanic and Atmospheric Administration's Miami laboratories, explained how the full dimensions and rounded shape of this feature had recently been identified.

The central part of the feature is occupied by a lake 550 feet deep, which had led to Soviet suspicion that it was of impact origin, although the lake's shape is rather irregular. When it was frozen, however, and the entire region blanketed in snow, it was found in images from an American earth resources satellite to lie within a strikingly circular rim 11 miles wide.

It is thought to have originated about one million years ago.

The Lehigh meeting was told of telescopic observations that have begun to link the various types of meteorites with specific asteroids. This was reported by Drs. Michael J. Gaffey and Thomas B. McCord of the Massachusetts Institute of Technology.

The surface composition of several hundred asteroids has been assessed in terms of the manner in which they reflect visible and infrared wavelengths of sunlight. Most seem to resemble various types of carbonaceous and stony-iron meteorites. One, however, designated 4 Vesta, seems covered with volcanic basalt like that forming the meteorites known as eucrites.

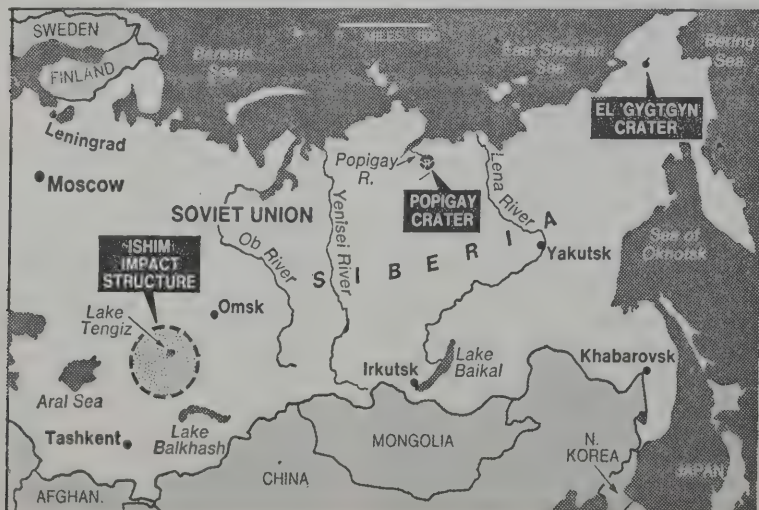
This suggested the dramatic possibility that it may become possible to trace individual meteorites to their home base in the asteroid belt.

Aurora Borealis Isn't Brighter As Observer Nears North Pole

HOUSTON (UPI)—Contrary to common belief, and for reasons not yet understood, the northern lights do not increase in intensity with closeness to the North Pole. Instead, the aurora is seen most frequently in a zonal region that extends around the world.

Scientifically known as the Aurora Borealis, the northern lights are created by a glowing of gases in the high atmosphere. They occur when streams of energetic charged particles, electrons and protons, enter the atmosphere from above.

These particles, called auroral primaries, collide with atmospheric atoms and molecules, imparting energy to them. The energy is then given off in the form of light of various colors.



Fossil of Whale Is Found By California Motorcyclist

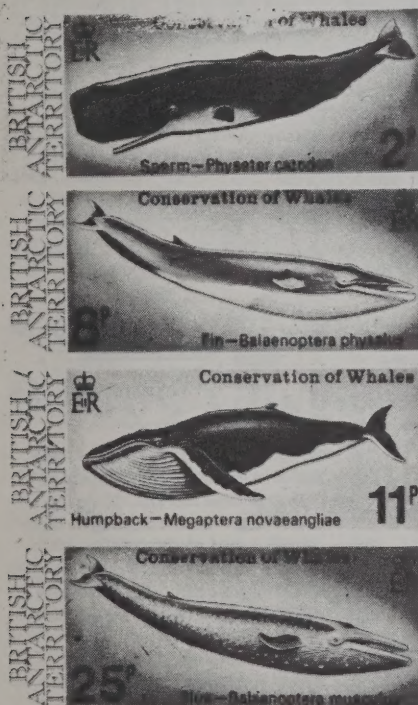
LOS ANGELES, Nov 25 (Reuters)—A college student motorcycling in the Santa Monica Mountains has discovered the fossil remains of a 14,000,000-year-old whale, officials of the Los Angeles County Museum of Natural History said today.

Museum officials called the discovery "of worldwide significance to the scientific community." They said it might help fill in an important missing link in the evolution of whales.

The 24-foot-long whale, an ancestor of today's blue whale, was found imbedded 1,600 feet up in the Santa Monica Mountains, which run from the ocean to a point just north of downtown Los Angeles.

Museum officials said that the whale had apparently been imbedded in the ocean floor and raised high up when a volcanic eruption millions of years later created the mountains.

The whale was discovered when a 22-year-old student, Reggie Sully, stumbled on one of the bones. Told that the discovery was of no significance unless he found the entire fossil, he went back and dug up the whale skeleton.



Whale conservation

The British Antarctic Territory advocates the conservation of whales with this quartet of stamps due on Jan. 4, 1977, advises the British Crown Agents Stamp Bureau. The designs of John Cooter feature the sperm whale (*Physeter catodon*), 2p; fin whale (*Balaenoptera physalus*), 8p; humpback whale (*Megaptera novaeangliae*), 11p; and the blue whale (*Balaenoptera musculus*), 25p. Multicolor lithography will be used by the Questa Security Colour Printers to produce the series.

Earth's Orbit Influenced The Ice Ages

Changes in the orbital motion of the earth around the sun have been identified as the "fundamental cause" of the earth's succession of ice ages.

Though the theory that the ice ages were caused by periodic variations in the earth's orbit was first proposed in the 1920's, it could not be confirmed until means were developed to measure the earth's climate over a very long time.

A team of British and American scientists, led by Dr. James H. Hays of Columbia University, obtained such measurements for the last 450,000 years by analyzing layers of fossil microorganisms in cores of sediment taken from beneath the floor of the south Indian Ocean.

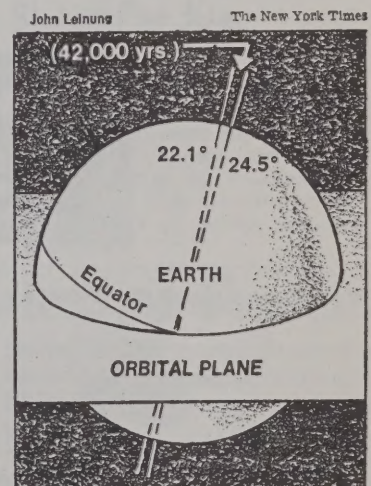
The dominant climatic cycle found in the cores was about 100,000 years long. This period matches the length of known cyclical changes in the earth's orbit, from nearly circular to elliptical and back. The scientists found that times of cold climate were closely associated with times of more nearly circular orbit. At present the orbit is elliptical, placing the earth closer to the sun for a longer period on each orbit, thus exposing the earth to more total solar radiation each year than if the orbit were circular.

Another cycle in the cores, about 42,000 years long, matches changes in the tilt of the earth's spin axis with respect to the plane of the solar orbit. This tilt varies from 22.1 degrees to 24.5 degrees over the length of the cycle. A low degree of tilt is followed, in the geological record, by times of

colder climate. "High tilt means warmer summers and cooler winters," Dr. Hays said, and low tilt the reverse. "We think what's important to building an ice sheet is not the accumulation of snow. We think what's critical is cooler summers."

The last ice age ended about 11,000 years ago, and the earth is now in one of its warmest periods. But a moderate cooling trend has already set in, according to Dr. Hays. The eccentricity of the earth's orbit is now high and decreasing toward the circular, and the earth's tilt was greatest about 9,000 years ago and is decreasing also. Both orbital changes make for colder temperatures.

Moreover, the accumulation of ice in the Northern Hemisphere has been found to lag behind the sea surface temperature drop in the Southern Hemisphere by about 3,000 years. Because sea surface temperatures in the Southern Hemisphere have already cooled to the glacial stage, Dr. Hays says there is "a high probability" that there will be substantially more ice in the Northern Hemisphere 3,000 years from now."



GLACIERS—ADVANCING OR RETREATING?

When Vancouver explored the southeastern Alaska coast in 1794, he found Glacier Bay filled with ice. Today it is mostly ice-free, but glaciologist William O. Field predicts that it may fill with ice again over a period of hundreds of years.

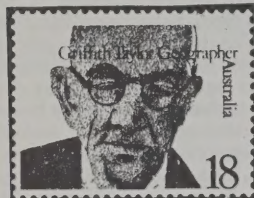
Though many Alaskan glaciers are retreating, quite a few others are advancing. Dr. Field, still active after 50 years of glacial observation, cites examples of glaciers nearly side by side, some of which are retreating and others advancing. He concludes that factors other than climatic change must be responsible.

Especially when glaciers spill into the sea, it appears that an unstable equilibrium exists. While the glacier ice always flows forward, the glacial snout advances and retreats, its position being determined by a complex interplay of snowfall, temperature throughout the year, deposition of rock debris and effects of ocean tides on iceberg calving rates. Studies lasting many decades are necessary to unravel these effects, effects that can have serious consequence to coastal shipping and land transportation facilities in glaciated areas.

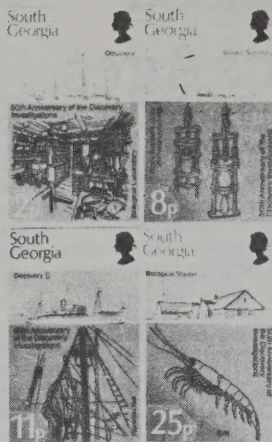
South Georgia to note 'Discovery' research

South Georgia will release a quartet of stamps in January 1977 to mark the 50th anniversary of the "Discovery" investigations, advise the British Crown Agents.

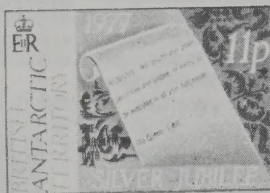
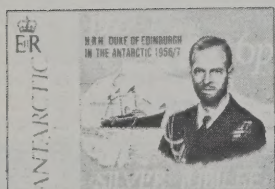
The vertical stamps feature the "Discovery" with a view of the interior of the biological laboratory, 2 pence; the "William Scoresby" and the Nansen-Pettersson water-sampling bottle, 8p; the "Discovery II" and a plankton net, 11p; and the biological station and krill, 25p.



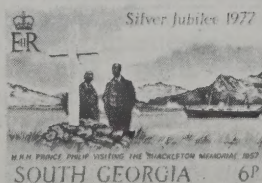
Australia, on Nov. 10, 1976, issued this 18¢ honoring Griffith Taylor, Antarctic Explorer.



A half century of investigations by the "Discovery" is marked by this foursome of stamps due from South Georgia in January 1977.

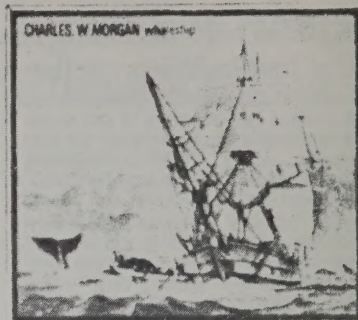
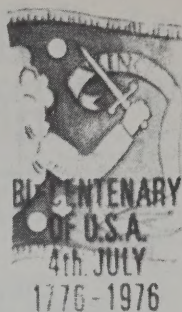


The British Antarctic Territory depicts the Queen before taking the oath as monarch.



South Georgia portrays Queen Elizabeth II and her retinue in procession after her coronation.

LINN'S STAMP NEWS



18^c NORFOLK ISLAND Stamp depicts whaleship

The whaleship "Charles W. Morgan," America's last surviving wooden whaleship, has been preserved since 1941 at Mystic (Conn.) Seaport, according to the Mystic Seaport Maritime Museum. The ship is depicted on the special series of Norfolk Island stamps, issued July 5 in honor of the U.S. Bicentennial.

Traffic series continues

Greenland will issue the 6th and 7th stamp in its series illustrating traffic, including the conveyance of mail, through the years, according to Grønlands Postvaesen, 100 Strandgade, Box 100, DK-1004 Copenhagen K, Denmark.

Due on Oct. 11, the 80-ore value depicts a Catalina aircraft which, until a few years ago, conveyed the majority of mail in that country. When landing was impossible, the mail was dropped by parachute, as indicated in the stamp's design.

The 1000 denomination depicts the coastal vessel "Kunnguak" of the Royal Greenland Trade Department. During the summer months the ship services the west coast of Greenland carrying passengers and mail.

The previously issued stamps of this series were released between 1971 and 1975 (Scott 70-74).



Greenland transportation of the mails is the subject of these two stamps issued on Oct. 11 in the continuing "traffic through the years" series of the country.



The light blue, gold and black emission, designed by Erik Ubbý using a study by H.C. Thomsen of Holsteinborg, depicts a pair of sleds and their dogs resting on the ice under the light of the pole star.

The stamp is a tribute to the Greenland sledge-dog, which with its unfailing good spirits, its staying power, frugality, and hardiness is still of great importance to the everyday life of people in the greater parts of Greenland.

A rest on the ice for sleds and sledge dogs is the design of this Christmas 1976 stamp issued by Greenland on Oct. 29.

Weather slowly reshapes body

IOWA CITY, Iowa (AP)—Slowly, cell by cell, a person's body is "redesigned" by extreme seasonal weather changes, says a University of Iowa professor of physiology.

For 16 years, Dr. G. Edgar Folk and his wife, Mary, have studied the physiology of animals living within the Arctic Circle and the effect of extreme cold on humans.

"Many people really don't realize that their body does adapt to extremes in weather," Folk said in an interview.

"Think about it, after a couple of weeks of winter, your face, hands and exposed parts of your body aren't as bothered by the weather."

The same thing happens in the summer, he said.

Some animals, like the grizzly bear, the caribou and the Alaskan wolf, have bodies designed to cope with extreme cold, but humans do not.

Subtle changes brought on by plunging or rising temperatures change the human body and make it more used to colder or warmer weather within a couple of weeks, he said.

Using cold as an example, Folk said: "The changes are mostly hormonal in nature, and as the balance changes, the fires of metabolism are stepped up and they remain elevated under the stimulus of cold.

"The blood vessels become more efficient at sending heat to the surface when it is needed."

Senators tour Barrow village

Three United States senators and their wives stopped in Barrow this week as part of an inspection tour of Alaska's North Slope.

Visiting Barrow were Sen. Adlai Stevenson of Illinois, Sen. John Durkin of Vermont, and Sen. Ernest Hollings of South Carolina. They were accompanied by their wives, and by Rita Gravel, wife of Alaska Sen. Mike Gravel, and Martha Huddleston, wife of Kentucky Sen. Walter Huddleston.

While in Barrow the group was briefed on the Eskimo way of life, given a tour of the village, and sampled dried fish, muktuk and Eskimo doughnuts.

The senators met with representatives of the Arctic Slope Regional Corporation, City of Barrow, and North Slope School District.

The Barrow dance group also performed for the Washington D.C. group. From Barrow the group continued on the Prudhoe Bay to inspect activities at the oil field there.

Aug. 21

Techniques Allow Study Of Icy Seas

WASHINGTON — New techniques are being used in the ice-encrusted coastal arctic marine environment to enable teams to do research year-round, according to a paper presented at an oceans conference here.

The National Oceanic and Atmospheric Administration is using new ice buoys and current meters, as well as satellites and helicopters, in its five-year study of the Beaufort Sea.

The agency's Arctic Project Office reported that the advancements will be useful in expanding searches for oil and other fossil fuels in the arctic and antarctic regions.

In another research paper, Herbert E. Bruce of the agency's Bering Sea-Gulf of Alaska Project Office said early indications are that petroleum resources are widely distributed in the Bering Sea and

Gulf of Alaska.

Field operations in the Gulf of Alaska during one year of the program involved 35 cruises on five vessels, three of which are devoted full-time to Alaskan outer continental shelf studies.

The program develops data required by the Interior Department for assessing possible environmental impacts caused by offshore oil and gas drilling.

Bruce said the broad variety of ecological systems and critical habitats in Alaska have made it virtually impossible to choose a few typical areas for study.

He said the primary objective of the program is to determine the path that contaminants would follow and the extent to which marine organisms would be exposed as a result of offshore oil drilling.

Circumpolar Meeting Is Slated For June

BARROW (AP) The Inuit Circumpolar Conference, a gathering of Native people from nations bordering the Arctic, has been postponed until June 13, 1977. The meeting organized by North Slope Borough Mayor and Democratic congressional candidate Eben Hopson was originally scheduled for

November in Barrow, but Hopson says heavy response resulted in a decision to "let out a little line on this project to make sure we pull it off properly." Hopson says the conference goal is the creation of a single set of rules for governments and industry in Arctic resource development.

Krill: A New Source of Protein

Reuter

BUENOS AIRES—Krill, a small shrimp-like creature, is the latest favorite among scientists and fishermen seeking new protein sources.

But experts say that if too many are caught, it could upset the ecological balance in southern waters and kill off fish, bird, whale and seal populations.

Researchers Aldo Tomo and Enrique Marschoff make this point in a report published by the Argentine Antarctic Institute (IAA), which is pressing for international regulations to prevent overexploitation of marine protein resources.

Krill, also known as euphasia superba, is a two-inch crustacean that has multiplied prodigiously with the decline in numbers of 115 main predator, the whale. Present stock of krill, which lie mostly in Antarctic waters between the southern tips of America and Africa, could sustain an annual

yield of from 75 to 150 million metric tons (one metric tons weights about 2, 200 pounds) as soon as markets are found.

Total world fish landings are about 80 million metric tons. Krill, which in Norwegian means young fish, contains from 13 to 18 per cent high-grade protein, fatty acids that are essential to human beings, and vitamins A and B.

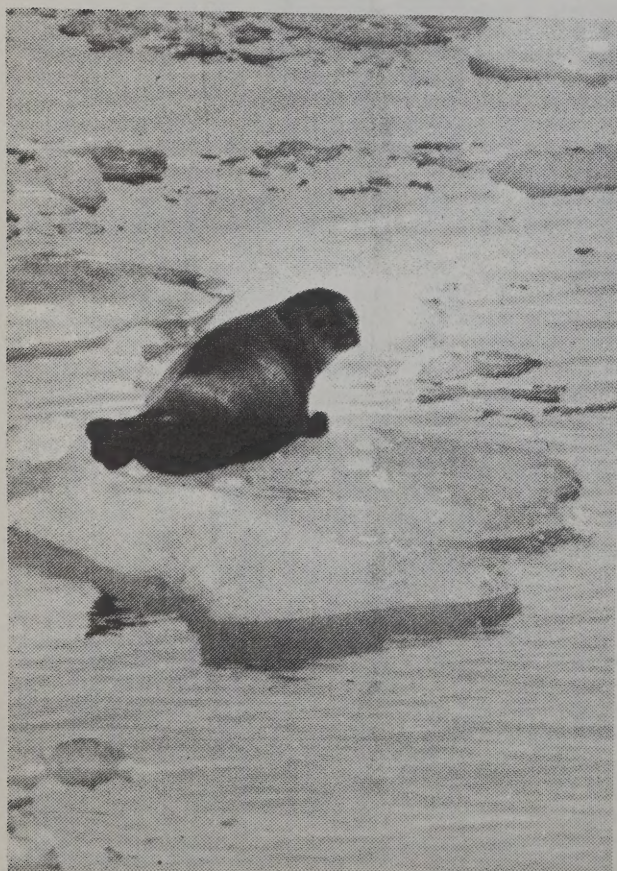
Several countries are considering possible commercial uses of krill, for example in cattle and chicken feeds. The Soviet Union, which began research on krill as early as 1971, already processes it into a paste that is mixed into various types of cheese. The product is sold under the brand name "Koral" for the red color it takes on from krill.

Chile has completed a trial catch and said it would distribute krill paste samples to prospective customers in the United States, Western Europe and Japan. Twelve different varieties have been found in Argentine waters and krill is fairly easy to catch according to the IAA report.



Oomingmak—Or bearded one, as the musk ox is called in the language of Nunivak Island Natives. Five Fairbanks area residents were recently among those

whose names were drawn for a hunt there this fall. Musk ox hunting began last fall following several years of controversy. Hunting of cows will be allowed for the first time this year.



Jim Martin



NOME GETS BUST OF EXPLORER

A bronze bust of polar explorer Roald Amundsen peers out from behind, from left, Einar S. Pederson Jr. of Trondheim, Norway; Capt. Robert W. Stevens of Wien Air Alaska and Lief Eie of Seattle, sales manager for Scandinavian Airlines. It was unveiled in Nome on Alaska Day.